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Vol. I.
TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1922 1923

No. 185

JOHN E. THROPP'S SONS COMPANY, PETITIONER,

vs.

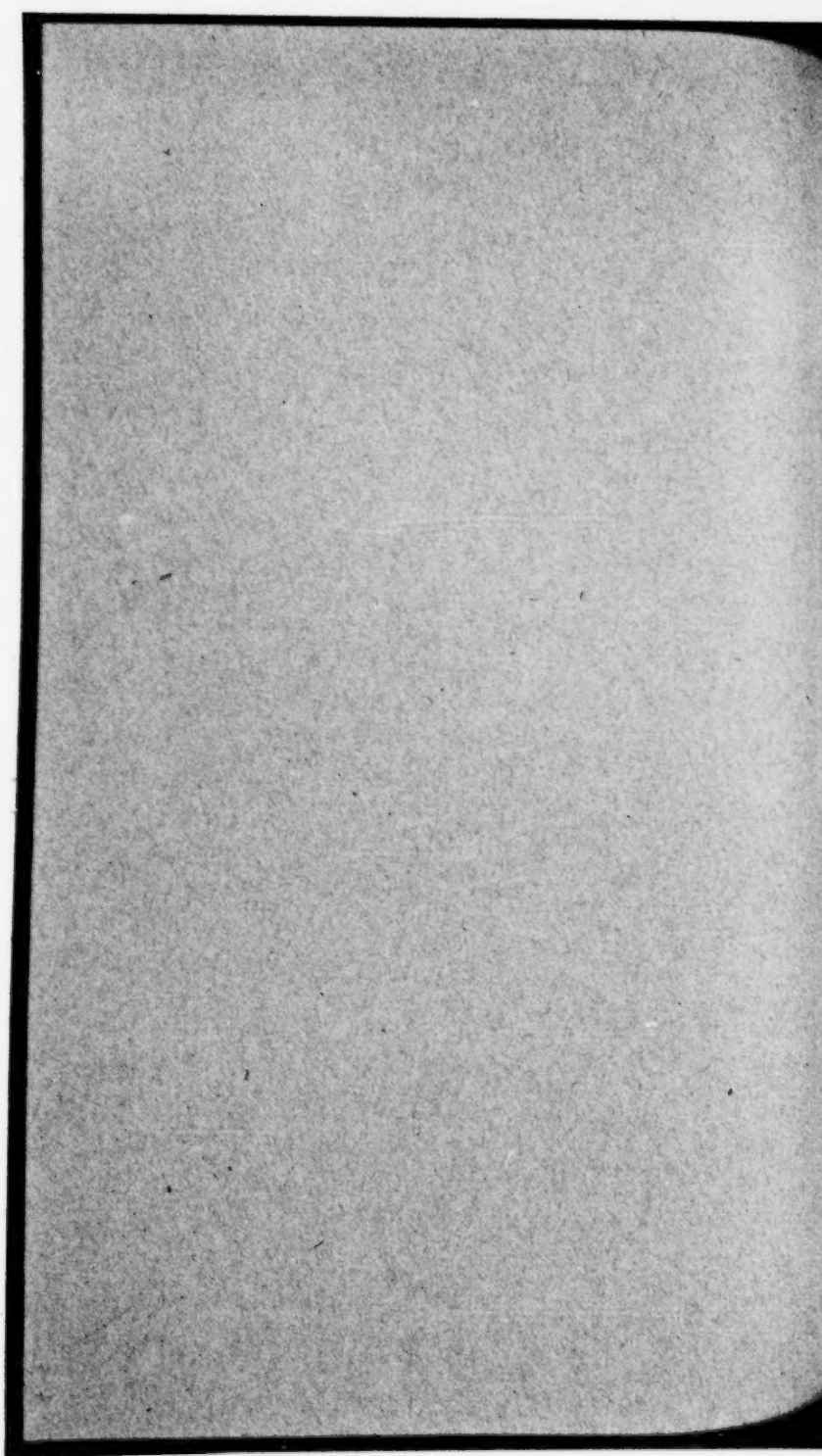
FRANK A. SEIBERLING.

**WEST OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE THIRD CIRCUIT.**

PETITION FOR CERTIORARI FILED JANUARY 2, 1924.

CERTIORARI AND RETURN FILED MARCH 20, 1922.

(29,324)



(29,324)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1922.

No. 774.

THE JOHN E. THROPP'S SONS COMPANY, PETITIONER,

vs.

FRANK A. SEIBERLING.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE THIRD CIRCUIT.

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IN THE
**UNITED STATES DISTRICT COURT FOR THE DISTRICT
 OF NEW JERSEY.**

In Equity.

Letters Patent Nos. 762, 561, and 941, 962.

FRANK A. SEIBERLING

v.

THE JOHN E. THROPP'S SONS COMPANY.

Docket Entries.

April 11, 1914. Bill filed.
 " 13, " Subpœna issued.
 " 14, " Subpœna returned, served April 13, and filed.
 May 4, " Note of Issue filed.
 " " Motion to dismiss bill filed.
 " 7, " Withdrawal of Motion filed.
 " 13, " Amended Bill of Complaint and Order filed.
 " 16, " Answer filed.
 July 11, " Stipulation and Order to take depositions filed.
 Sept. 17, " Stipulation and Order extending time to take depositions filed.
 Oct. 29, " Stipulation and Order extending time to take depositions filed.
 Dec. 18, " Stipulation and Order extending time to take depositions filed.
 Feb. 2, 1915. Stipulation and Order extending time to take depositions filed.
 April 12, " Stipulation and Order extending time to take depositions filed.
 June 9, " Stipulation and Order extending time to take depositions filed.
 Sept. 10, " Stipulation and Order extending time to take depositions filed.
 Nov. 3, " Cause placed on Calendar.
 " 27, " Stipulation and Order extending time to take depositions filed.
 Feb. 7, 1916. Stipulation and Order extending time to take depositions filed.
 April 14, " Stipulation and Order extending time to take depositions filed.
 July 11, " Stipulation and Order extending time to take depositions filed.

- Sept. 5, 1916. Cause placed on Calendar.
 " " " Continued for Term.
 " 14, " Stipulation and Order extending time to take depositions filed.
 Dec. 13, " Stipulation and Order extending time to take depositions filed.
 Feb. 16, 1917. Stipulation and Order extending time to take depositions filed.
 April 10, " Stipulation and Order extending time to take depositions filed.
 June 13, " Stipulation and Order extending time to take depositions filed.
 Sept. 18, " Stipulation and Order extending time to take depositions filed.
 Jan. 2, 1918. Stipulation and Order extending time to take depositions filed.
 Mar. 15, " Stipulation and Order extending time to take depositions filed.
 June 25, " Stipulation and Order extending time to take depositions filed.
 Sept. 25, " Stipulation and Order extending time to take depositions filed.
 Mar. 10, 1919. Stipulation and Order for Amendment to Answer filed.
 " 28, " Amended Answer and Stipulation filed.
 June 9, " Depositions on behalf of defendant filed.
 " 28, " Depositions of Harvey J. Butaker and Harry K. Raymond, on behalf of defendant filed.
 July 7, " Depositions on behalf of defendant filed.
 Nov. 6, " Depositions on behalf of complainant filed.
 " 17, " Complainant's Prima Facie Proofs filed.
 " " " Complainant's Rebuttal Proofs filed.
 Jan. 17, 1921. Defendant's Testimony filed.
 Mar. 31, " Depositions on behalf of defendant filed.
 April 11, " Stipulation and Order withdrawing files for printing &c. filed.
 Dec. 13, " Final Hearing.
 " 14, " Final Hearing. Decision reserved.
 Feb. 14, 1922. Memorandum filed.
 " 21, " Final Decree dismissing Bill with costs to defendant filed.
 Mar. 2, " Assignment of Errors filed.
 " " " Petition for Appeal and Order allowing Appeal filed.
 Mar. 30, " Bond on Appeal filed.
 " " " Citation issued.

United States District Court,

DISTRICT OF NEW JERSEY.

10

FRANK A. SEIBERLING,
Plaintiff,

VS.

THE JOHN E. THROPP'S SONS COM-
PANY,
Defendant.

In Equity #614.
Upon Patents
Nos. 762,561
and 941,962.

20

Amended Bill of Complaint.

(Filed May 13, 1914.)

TO THE HONORABLE THE JUDGES OF THE UNITED STATES
DISTRICT COURT IN AND FOR THE DISTRICT OF NEW
JERSEY :

Plaintiff for his cause of action alleges as follows:

1. That plaintiff, Frank A. Seiberling, is a citizen of³⁰
the United States, and a resident and inhabitant of the
Eastern Division of the Northern District of Ohio, and
has a place of business in the city of Akron in said
division and district; and upon information and belief
that defendant, The John E. Thropp's Sons Company,
is an existing corporation organized under the laws of
the State of New Jersey, and a resident and inhabitant
of the district and state of New Jersey, and has a regular
and established place of business in the city of Trenton. 40

Amended Bill of Complaint.

2. Upon information and belief that the jurisdiction of this court depends upon the facts that this suit is one arising under the patent laws of the United States.

3. That plaintiff, together with one William C. Stevens, being, under the then existing patent laws of the United States, the joint inventors of certain improvements in machines for making outer casings for double tube tires, 10 duly made application on November 28th, 1903, to the Commissioner of Patents of the United States for patent for said improvements and that United States Letters Patent No. 762,561 were lawfully granted on June 14th, 1904, to said inventors as joint patentees, they having duly complied with all the requirements of the then existing statutes of the United States and the rules of the Patent Office; whereby the exclusive rights in said im-
20 provements were secured to said patentees for seventeen years thereafter; as by said patent or certified copy thereof in court to be produced will more fully appear.

4. That on March 23rd, 1909 said William C. Stevens, by an instrument in writing duly assigned to plaintiff his entire right, title and interest in said patent No. 762,561, together with all claims for damages and profits for past infringement; which instrument was recorded in the Patent Office March 25th, 1909.

30 5. Upon information and belief that one Will C. State, being, under the then existing patent laws of the United States, the inventor of certain improvements in pneumatic tire shoe manufacturing machines, duly made application on March 26th, 1909, to the Commissioner of Patents of the United States for patent for said im-
40 provements, and that United States Letters Patent No. 941,962 were lawfully granted on November 30th, 1909, he having duly complied with all the requirements of the then existing statutes of the United States and the rules of the Patent Office.

Amended Bill of Complaint.

6. That said Will C. State, prior to the issue of said patent No. 941,962, namely on March 22nd, 1909, assigned to plaintiff his entire right, title and interest in his said invention and requested the Commissioner of Patents to issue to plaintiff the patent thereon, which instrument was recorded in the United States Patent Office March 31st, 1909; whereupon said patent No. 941,962 was granted on the date aforesaid to plaintiff as patentee; whereby the exclusive rights in said improvements were secured to said patentee for seventeen years thereafter; as by said patent or certified copy thereof in court to be produced will more fully appear. 10

7. That plaintiff is now, and has been at all times since March 23rd, 1909, the sole and exclusive owner of each of said patents Nos. 762,561 and 941,962, respectively and the inventions covered thereby, and all claims for damages and profits arising out of infringement thereof. 20

8. That plaintiff or his licensees have expended large sums of money in making the inventions of both of said patents profitable to themselves and useful to the public; that said inventions have been and are of great benefit and advantage to the public; that plaintiff's rights thereunder have been extensively acknowledged and acquiesced in by the public; that licenses have been granted under both of said patents to enable said inventions to be practiced, and large royalties were paid to plaintiff thereunder; that plaintiff and his licensees are entitled to be protected in their enjoyment of said inventions; and that plaintiff upon learning of this defendant's infringement hereinafter referred to did promptly give defendant due notice of said patents and plaintiff's rights thereunder. 80

9. Upon information and belief that, heretofore and during plaintiff's ownership of said patents, defendant, 40

Amended Bill of Complaint.

unlawfully, without license or consent of plaintiff, and within the District of New Jersey, and elsewhere in the United States, has infringed upon said patent No. 762,561, and also upon said patent No. 941,962, and also upon said two patents jointly by making and using machines for manufacturing shoes or outer casings for pneumatic or double tube tires, containing the inventions of each and of both of said patents in suit, and has thereby
10 realized large profits and advantages which would otherwise have accrued to plaintiff; that defendant is continuing, and threatening to continue, the manufacture and use of said infringing machines; and that by defendant's unlawful acts plaintiff has been and is being caused large and irreparable damage.

10. Upon information and belief that the claims of the said patents upon which defendant has been and is now infringing are as follows: patent No. 762,561,
20 claims 1, 2 and 14; patent No. 941,962, claims 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 17, 22, 23, 24, 25 and 26.

WHEREFORE plaintiff, waiving verification of defendant's answer herein, when filed, hereby prays the court;

(1) That writs of injunction, as well provisional as permanent, be issued and served, enjoining and restraining defendant, The John E. Thropp's Sons Co., its solicitors, clerks, servants, agents, attorneys and workmen,
30 from directly or indirectly in any manner infringing upon said patents Nos. 762,561 and 941,962 or either of them;

(2) That defendant account to plaintiff for the profits made by defendant and the damage sustained by plaintiff; and that, upon rendering a decree herein, the amount of damages assessed shall be trebled in view of the wilful and unjust infringement of defendant;

40 (3) That costs be awarded to plaintiff;

Amended Bill of Complaint.

(4) And that such other and further relief may be accorded to plaintiff as appears to be proper and agreeable to equity.

FRANK A. SEIBERLING,
Plaintiff

ROGERS, KENNEDY & CAMPBELL
Solicitors for Plaintiff

JAMES Q. RICE
Of Counsel

ROBERT F. ROGERS
Of Counsel.

10

VERIFICATION.

UNITED STATES OF AMERICA }
State of New York } ss.
County of New York }

FRANK A. SEIBERLING, being duly sworn, deposes and says that he is the plaintiff in this suit, and that he has read and signed the foregoing amended bill of complaint, and that the same is true to his own knowledge, excepting as to the matters therein stated to be alleged upon information and belief, and as to those matters he believes it to be true, and that he believes that he with the said William C. Stevens, referred to in said bill of complaint, were the true, original, first and joint inventors of the improvements disclosed and covered in said patent in suit No. 762,561, and that the said Will C. State, referred to in said bill of complaint, was the true, original, first and sole inventor of the improvements disclosed and covered in said patent in suit No. 941,962.

20
30

FRANK A. SEIBERLING

Subscribed and sworn to before }
me this 8th day of May, 1914. }

WILLIAM JAMES DOLAN
Notary Public

Rockland County
Certificate filed N. Y. County No. 95
New York Register No. 6168.
Commission expires March 30, 1916.

40

UNITED STATES DISTRICT COURT

DISTRICT OF NEW JERSEY,

FRANK A. SEIBERLING,
Plaintiff.

vs.

JOHN E. THROPP & SONS COMPANY,
Defendant.

In Equity
Upon Patents,
Nos. 762,561
and 941,962

10

Order.

Upon motion and annexed consent of counsel for both parties hereto it is hereby

ORDERED AS FOLLOWS:

20 1. That the amended bill of complaint herewith presented by plaintiff for filing shall be and the same hereby is ordered to be filed and entered herein in the place of the original bill of complaint.

2. That defendant's motion to dismiss the bill of complaint be and the same hereby is withdrawn, it appearing to the satisfaction of the parties and the Court that said bill has been amended by plaintiff so far as the said motion properly demands.

30 3. That the summons and other process heretofore issued or served herein may be and hereby are amended by changing the name of the defendant to read "The John E. Thropp's Sons Company."

4. That defendant shall file its answer or other defense hereto on or before May 16th, 1914 on failure of which plaintiff may take decree *pro confesso*.

Dated, Trenton, N. J. May 13th, 1914.

JOHN RELLSTAB.

U. S. District Judge.

40

Order.

Consent.

On behalf of the respective parties hereto counsel hereby consent to the entry of the above form of order.

Dated, New York, May 8th, 1914.

ROBERT F. ROGERS

Counsel for Plaintiff.

E. CLARKSON SEWARD.

Counsel for Defendant.

10

At a stated term of the District Court of the United States in and for the District of New Jersey, held in the courtrooms of said Court in the City of Newark on the 3rd day of February, 1919.

Present :

THOMAS G. HAIGHT

U. S. Judge.

20

FRANK A. SEIBERLING,

Plaintiff,

v.

THE JOHN E. THROPP'S SONS COMPANY,
Defendant.

In Equity
No. 614.

Order.

This matter coming on for consideration upon the motion of plaintiff and the annexed consent of both parties by their solicitors, now, then, good and sufficient cause appearing therefor, it is hereby

30

ORDERED, as follows:

(1) That the testimony in this cause of any and all witnesses shall be taken out of court, before Edward O'Byrne, Esq., or other standing Examiner of this Court, or in appropriate instances outside of this district by any

40

Order.

duly qualified Examiners or notaries public, agreed upon by the parties, who may act as special examiners without further appointment.

10 (2) That plaintiff may have until April 1, 1919, for taking its *prima facie* proofs, defendant until July 1, 1919 for its proofs in defense, and plaintiff until August 15, 1919 for its rebuttal.

(3) That either party taking testimony hereunder shall give the solicitors of the other party five days' notice thereof, setting forth the names of the witnesses, the examiner, and the place, date and hour of the testimony.

THOMAS G. HAIGHT
U. S. Judge.

20 On this third day of February, 1919, we hereby consent to the making and entry of the above form of order.

ROGERS, KENNEDY & CAMPBELL
Solicitors for Plaintiff.

E. CLARKSON SEWARD
Solicitor for Defendant.

30

40

IN THE UNITED STATES PATENT OFFICE.

Disclaimer

PERTAINING TO PATENT No. 941,962.

(Filed in the Patent Office, Feb. 15, 1919).

TO THE HONORABLE COMMISSIONER OF PATENTS,
Washington, D. C.

I, FRANK A. SEIBERLING, a citizen of the United States, residing at Akron, in the County of Summit, and State of Ohio, hereby represent, in the matter of a certain improvement in Pneumatic Tire Shoe Manufacturing Machines for which Letters Patent of the United States No. 941,962 were granted to me as assignee of Will C. State, also of said Akron, Ohio, on the 30th day of November, 1909, that I am the owner of the entire interest in said patent by reason of the aforesaid grant thereof to me, and that I have reason to believe that through inadvertence, accident or mistake, and without fraudulent or deceptive intention, 20 the specification and claim of said Letters Patent are in part too broad, including that of which said State was not the first inventor.

Now, therefore, I hereby enter disclaimer, as follows:

FIRST: In respect to each of claims 4, 5, 6 and 7, of said patent, I hereby disclaim any combination of the recited elements *except when* constructed and co-ordinated for shaping and applying a previously unshaped sheet- 30 fabric strip to that part of the recited ring-core beyond the tread portion, *and unless* the ring-core is rotatable at fast speed by the power-drive, whereby the unapplied fabric portion is thrown out from the side of the ring-core by centrifugal force, and the recited spinning-roll support is mechanically mounted to ensure its radial movement with a gradual advance in proper relation to the fast rotating ring-core, whereby the spinning-roll, by such gradual advance over the ring-core and while pressed 40

Disclaimer.

toward it, acts gradually upon the centrifugally thrown-out fabric to shape it to the side of the rotating ring-core while bringing it into adhesive contact therewith.

SECOND: In respect to each of claims 12 and 13 of said patent, I hereby disclaim any combination of the recited elements, *except for* the combined operations of first
10 stretching the middle or tread portion of a previously unshaped fabric strip onto the recited ring-core and thereafter shaping and applying to the ring-core the fabric beyond the tread portion, *and unless* the recited elements are so constructed and co-ordinated that before the change from slow speed to fast speed the fabric strip as drawn from the recited stock roll onto the ring-core is stretched circumferentially under uniform tension while applying it to the tread portion, and, after the change to fast speed,
20 the unapplied fabric beyond the tread portion is thrown out from the side of the ring core by the consequent centrifugal force, while the recited spinning-roll, in its radial movement, acts gradually upon the centrifugally thrown-out fabric, to shape it to the side of the rotating ring-core beyond the tread portion while bringing it into adhesive contact therewith.

THIRD: In respect to each of claims 22, 23, 24, 25 and
30 26, of said patent, I hereby disclaim any combination of the recited elements *except when* constructed and co-ordinated for shaping and applying a previously unshaped sheet-fabric strip to that part of the recited ring-core beyond the tread portion, *and unless* the power-drive for the ring-core functions by a sufficiently high speed of rotation and consequent centrifugal force to throw the unapplied fabric portion out from the side of the ring-core, while the recited spinning-roll, in its radial movement and while
40 pressed toward the ring-core, functions by a gradual

Disclaimer.

action upon such centrifugally thrown-out fabric, to shape it to the side of the rotating ring-core while bringing it into adhesive contact therewith.

FOURTH: I hereby further disclaim that part of the claim of invention in said patent contained in claims 8, 9, 10, 11, 14, 15, 16 and 17, respectively.

10

FIFTH: In respect to the specification of said patent, I hereby disclaim at page 1, lines 79-80, the words "and an important feature of my invention", and at page 1, lines 92-93, the words "as another feature of my invention".

SIGNED at New York in the County of New York and State of New York, this 13th day of February, 1919.

FRANK A. SEIBERLING.

20

Witnesses:

R. F. ROGERS.

ARTHUR S. BROWNE.

30

40

UNITED STATES DISTRICT COURT,
DISTRICT OF NEW JERSEY.

10	<p style="text-align: center;">FRANK A. SEIBERLING, Complainant</p> <p style="text-align: center;">vs.</p> <p style="text-align: center;">THE JOHN E. THROPP'S SONS COMPANY, Defendant</p>	<p>In Equity No. 614.</p>
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Amended Answer.

(Filed March 28, 1919.)

20 THE AMENDED ANSWER OF THE ABOVE NAMED DEFEND-
ANT TO THE AMENDED BILL OF COMPLAINT OF THE ABOVE
NAMED COMPLAINANT.

I. This defendant admits the allegations contained
in Paragraphs 1 and 2 of the said Bill of Complaint.

80 II. This defendant admits that United States Let-
ters Patent No. 762561 were granted on June 14, 1904,
to Frank A. Seiberling and William C. Stevens, but
denies that said patent was lawfully granted. As to
whether or not the complainant and said William C.
Stevens duly made application for said Letters Patent
and complied with all the requirements of the then exist-
ing statutes of the United States and the Rules of the
Patent Office, as alleged in said Bill of Complaint, this
defendant is without knowledge and leaves the complain-
ant to his proof thereof.

40 III. This defendant denies that the complainant and
said William C. Stevens were, on November 28, 1903, or

Amended Answer.

at any time, under the then existing patent laws of the United States, the joint inventors of certain improvements in machines for making outer casings for double tube tires as alleged in said bill of complaint; but says, upon information and belief, that the said alleged improvements of the said patent No. 762561, and all substantial and material parts thereof, and particularly of claims numbers 1, 2 and 14 thereof, had been known and used by others in this country before the said complainant and William C. Stevens made the said alleged invention or discovery thereof, and had been in public use and on sale in this country prior to the said alleged invention or discovery and for more than two years before the alleged application for said letters patent No. 762561; and further, that the said alleged invention had been described and illustrated in printed publications and patents prior to the date of the said alleged invention or discovery and more than two years prior to the alleged application for patent; and specifies instances of such prior publication as follows:

LETTERS PATENT OF THE UNITED STATES:

No. 125598.....	T. J. Mayall.....	April 9, 1872	
125599.....	T. J. Mayall.....	Apr. 9, 1872	
6162	J. R. Moffitt (Reissue).....	Dec. 8, 1874	
186256.....	G. E. Jones.....	Jan. 16, 1877	
215321.....	H. Gavin.....	May 13, 1879	30
284929.....	S. Wheeler.....	Sept. 11, 1883	
286115.....	J. Chaumont.....	Oct. 2, 1883	
410521.....	G. L. Jaeger.....	Sept. 3, 1889	
420354.....	S. Odenheimer.....	Jan. 28, 1890	
428190.....	A. Watts & R. Henry.....	May 20, 1890	
438407.....	M. W. Dewey.....	Oct. 14, 1890	
518112.....	G. C. Moore.....	Apr. 10, 1894	
557729.....	A. T. Tregurtha.....	Apr. 7, 1896	
557791.....	J. Findlay.....	Apr. 7, 1896	
558735.....	J. P. Luckett.....	Apr. 21, 1896	
607245.....	T. B. Jeffery.....	July 12, 1898	40

Amended Answer.

642976.....	T. H. Grigg.....	Feb. 6, 1900
648930.....	H. J. Doughty.....	May 8, 1900
658901.....	W. H. Taneyhill.....	Oct. 2, 1900
692012.....	G. E. Heyl-Dia.....	Jan. 28, 1902
725155.....	F. A. Seiberling.....	April 14, 1903
745300.....	U. P. Smith.....	Nov. 24, 1903

LETTERS PATENT OF THE KINGDOM OF GREAT BRITAIN.

10	No. 23135	The Thomas & William Caldwell Syndicate Ltd. <i>et al.</i>	Nov. 3, 1898
	27486	W. & L. Swain.....	Dec. 30, 1898
	5430	Swain.....	1898
	3851	The Swain Patents Syndicate Ltd. and W. Swain.....	Feb. 28, 1900

LETTERS PATENT OF THE REPUBLIC OF FRANCE.

289195.....	The Radax Pneumatic Tire Co., Ltd.	1899
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20 LETTERS PATENT OF AUSTRIA.

1136	The Radax Pneumatic Tyre Co., Ltd.	Dec. 15, 1899
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and other patents and publications of which the said defendant has not now the particulars, but which it craves leave to insert in this Answer by way of Amendment as soon as said particulars are received. This defendant specifies instances of such prior knowledge and use as follows; by the patentees of the above mentioned
 30 patents at the places of residence specified in said patents respectively. Wherefore said claims of said patent No. 762561 are invalid.

IV. This defendant is without knowledge with regard to the matters alleged in Paragraph 4 of the said Bill of Complaint and leaves the complainant to his proof thereof.

V. This defendant denies that complainant and said
 40 William C. Stevens were the true joint inventors of the

Amended Answer.

improvements of said patent, and particularly of claims 1, 2, and 14 thereof, but alleges, upon information and belief, that said improvements were the sole invention of the said William C. Stevens. Wherefore said claims are invalid.

VI. This defendant says that claims 1, 2 and 14, of said patent No. 762561 are not distinct, wherefore said claims are invalid. 10

VII. This defendant says, upon information and belief, that the apparatus shown and described in said patent No. 762561, and particularly set forth in claims 1, 2 and 14, is without utility and inoperative; wherefore said claims are invalid.

VIII. This defendant says, upon information and belief, that for the purpose of deceiving the public, the description filed in the Patent Office and contained in 20 the said patent No. 762561, was made to cover less than the whole truth relevant to the apparatus set forth therein, and particularly claimed in claims 1, 2 and 14; wherefore said claims are invalid.

IX. This defendant says that the description of the alleged invention in the said patent No. 762561, is not in such full, clear, concise, or exact terms as to enable any person skilled in the art to which it appertains or with 30 which it is most nearly connected, to make or use the same, and particularly the apparatus set forth in claims 1, 2 and 14; wherefore said claims are invalid.

X. This defendant says that claims 1, 2 and 14 of said patent No. 762561 all cover aggregations and not combinations, and hence are invalid.

XI. This defendant says that claims 1, 2 and 14 of said patent No. 762561 are void for want of patentable invention. 40

Amended Answer.

XII. This defendant admits that United States Letters Patent No. 941962 were granted to Frank A. Seiberling, November 30, 1909, as assignee of Will C. State, but denies that said patent was lawfully granted. As to whether or not said Will C. State duly made application
10 for said Letters Patent and complied with all the requirements of the then existing Statutes of the United States and the rules of the Patent Office, as alleged in said Bill of Complaint, this defendant is without knowledge and leaves the complainant to his proof thereof.

XIII. This defendant denies that said Will C. State was on March 26, 1909, or at any time, under the then existing patent laws of the United States, the inventor
20 of certain improvements in pneumatic tire shoe manufacturing machines as alleged in said bill of complaint; but says, upon information and belief, that the said alleged improvements of the said patent No. 941962, and all substantial and material parts thereof, and particularly of claims numbers 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 17, 22, 23, 24, 25 and 26 thereof, had been known and used by others in this country before the said Will C. State made said alleged invention or discovery thereof, and had been in public use and on sale in this country
30 prior to the said alleged invention or discovery and for more than two years before the alleged application for said letters patent No. 941962, and further, that the said alleged invention had been described and illustrated in printed publications and patents prior to the date of said alleged invention or discovery and more than two years prior to the alleged application for patent; and specifies as instances of such prior publications the patents set forth in Paragraph III hereof, and in addition
40 thereto the following:

Amended Answer.

LETTERS PATENT OF THE UNITED STATES.

No. 753813.....	U. P. Smith.....	March	1, 1904
762561.....	F. A. Seiberling & W. C. Stevens.....	June	14, 1904
782017.....	A. N. Fairman.....	Feb.	7, 1905
794473.....	A. E. Vincent.....	July	11, 1905
800598.....	F. A. Seiberling & U. P. Smith.....	Sept.	26, 1905
832207.....	J. R. Pierce.....	Oct.	2, 1906
847041.....	E. D. C. Bayne & L. A. Subers.....	Mar.	12, 1907
852855.....	T. & R. Sloper.....	May	7, 1907
906588.....	A. E. Vincent.....	Dec.	15, 1908 10
16564.....	Cannon.....	Feb.	3, 1857
67262.....	Buzzee.....	July	30, 1867
80836.....	Seymour.....	August	11, 1868
152325.....	Boeklen <i>et al.</i>	June	23, 1874
221456.....	Hall.....	Nov.	11, 1879
231327.....	Joslin.....	August	17, 1880
240145.....	Kearns <i>et al.</i>	April	12, 1881
260298.....	Kelsey.....	June	27, 1882
376167.....	Seymour.....	Jan.	10, 1888
669836.....	Johnstone.....	March	12, 1901
669837.....	Johnstone.....	March	12, 1901
813604.....	Watzke.....	Feb.	27, 1906

LETTERS PATENT OF THE KINGDOM OF GREAT BRITAIN.

20

No. 4834.....	V. P. Pfister <i>et al.</i>	Mar.	14, 1900
10059.....	L. Johnstone.....	May	4, 1903
20440.....	G. A. E. Kohler.....	Sept.	22, 1904
23590.....	T. & R. Sloper.....	Nov.	16, 1905
18587.....	The New Eccles Rubber Works Ltd. <i>et al.</i>	Aug.	20, 1906
24965.....	Black.....		1897
17432.....	Walton.....		1906
1207.....	Hubbard <i>et al.</i>		1907

LETTERS PATENT OF THE REPUBLIC OF FRANCE.

30

No. 349812.....	A. E. Vincent.....	April	12, 1904
5864.....	A. E. Vincent.....	Jan.	11, 1906
364819.....	P. M. C. Nivet.....	March	31, 1906
364820.....	P. M. C. Nivet.....	March	31, 1906
370188.....	T. Sloper & R. Sloper.....	Aug.	20, 1906
371493.....	J. B. A. Nivet.....	Nov.	14, 1906
384143.....	E. D. C. Bayne & L. A. Subers.....	Nov.	18, 1907
395812.....	M. Hernandez.....	Jan.	7, 1908

LETTERS PATENT OF THE EMPIRE OF GERMANY.

No. 199424.....	T. Sloper & R. Sloper.....	Aug.	15, 1906
200627.....	E. D. C. Bayne & L. A. Subers.....	March	13, 1907
206197.....	A. Mathern.....	Dec.	20, 1906 40

Amended Answer.

LETTERS PATENT OF AUSTRIA.

No. 20497Phil. Penin. Gummi-Fabrik A.G. April 1, 1907

LETTERS PATENT OF BELGIUM.

No. 194731.....MathernSept. 20, 1906

10 and other patents and publications of which the said defendant has not now the particulars, but which it craves leave to insert in this Answer by way of Amendment as soon as said particulars are received. This defendant specifies instances of such prior knowledge and use as follows: By the B. F. Goodrich Company at Akron, Ohio. By the Bayne-Subers Tire and Rubber Co., at Cleveland, Ohio. By the Goodyear Tire & Rubber Co., at Akron, Ohio. By the Lee Tire & Rubber Co., at Conshohocken, Penn., and by the patentees of the patents above referred to at the places of residence recited in the said patents
20 respectively. Wherefore said claims of said patent No. 941,962 are invalid.

XIV. This defendant is without knowledge as to the matters contained in Paragraph 6 of the said Bill of Complaint, except the allegation as to the grant of the Patent No. 941,962, and accordingly, leaves the complainant to his proof thereof.

30 XV. This defendant says, upon information and belief, that said Will C. State was not the sole inventor of the apparatus set forth in said patent No. 941,962, and particularly in the above noted claims thereof; but that he was joint inventor thereof together with certain other parties who developed the said apparatus with him and contributed material parts thereto, the names of said other parties being William Sackman, Frank R. Chamberlain, William J. Kreuder, Otis O. Smith and Chas. Wattel-
40 worth, all at said time being of Akron, Ohio.

Amended Answer.

XVI. This defendant says that the above noted claims of said patent No. 941,962 are not distinct; wherefore said claims are invalid.

XVII. This defendant says, upon information and belief, that the apparatus shown and described in said patent 941,962, and particularly set forth in the above noted claims thereof is without utility and inoperative; 10 wherefore said claims are invalid.

XVIII. This defendant says, upon information and belief, that for the purpose of deceiving the public, the description filed in the Patent Office and contained in said patent 941,962, was made to cover less than the whole truth relevant to the apparatus set forth therein, and particularly claimed in the above noted claims; and that the complainant herein and the said Will C. State, during the pendency of the said application in the Patent Office, 20 made misrepresentations to the Patent Office officials containing matters relevant to the alleged invention and particularly the apparatus recited in the above named claims; which misrepresentations were in the form of affidavits filed with the said application, and which affidavits were made to contain inaccurate statements by said complainant and Will C. State, and were filed for the purpose of misleading with regard to the facts as to the invention, and actually did so mislead and cause the said patent 30 941,962 to be granted in its present form. Wherefore said claims are invalid.

XIX. This defendant says that the description of the alleged invention in the said patent 941,962 is not in such full, clear, concise, or exact terms as to enable any person skilled in the art to which it appertains or with which it is most nearly connected, to make or use the same, and particularly the apparatus set forth in the above noted claims; wherefore said claims are invalid.

Amended Answer.

XX. This defendant says, upon information and belief, that the above noted claims of patent 941,962 are broader than the invention set forth in the original application for said patent; wherefore said claims are invalid.

XXI. This defendant says, upon information and belief, that the above noted claims of said patent 941,962
10 were so limited by the applicant during the prosecution of the application for said patent, that complainant is now estopped to claim for them a construction sufficiently broad to cover any apparatus manufactured or used by this defendant.

XXII. This defendant says, upon information and belief, that the apparatus shown in the said patent 941,962, and particularly set forth in the above named
20 claims, has never been manufactured, and that the complainant has never marked any machines manufactured or disposed of by him, with the word "Patented" or any abbreviation thereof, or with the date of the said patent or number thereof, or any of these things, as required by Section 4900, Revised Statutes of the United States.

XXIII. This defendant says that the above noted claims of said patent 941,962 are void for want of patent-
30 able invention.

XXIV. This defendant says that the previously noted claims of said patent 941,962 cover aggregations and not combinations, and hence are invalid.

XXV. This defendant says, upon information and belief, that the plaintiff has disclaimed, by formal document executed and filed in the Patent Office, subsequent to the issuance of said patent No. 941,962, the whole substance
40 of the alleged invention set forth in said patent.

Amended Answer.

XXVI. This defendant says that said disclaimer named in Paragraph XXV hereof was unlawfully made and filed, and that the changes in the said patent attempted to be made by said disclaimer should, under the law, if made at all, have been made by way of reissue; and that plaintiff unreasonably delayed the filing of said disclaimer.

XXVII. This defendant denies, upon information and belief, the allegations contained in Paragraph 7 of said Bill of Complaint; and avers that the Goodyear Tire and Rubber Company of Akron, Ohio, is the owner of part or all of the legal and equitable title to each of said patents Nos. 762,561 and 941,962, and is therefore a necessary party to this suit. ¹⁰

XXVIII. This defendant denies, upon information and belief, the allegations contained in Paragraph 8 of the Bill of Complaint and says that the inventions of neither of said patents have been profitable or useful or of any benefit or advantage whatsoever to the public; and that the complainant's rights under neither of said patents have been acknowledged or acquiesced in by the public; but that numerous concerns have been for long periods using, in defiance of complainant's alleged rights, tire making machines corresponding to the subject-matter included in the above noted claims of both said patents; and cites as specific instances of such use in defiance of said alleged rights, the Miller Rubber Company of Akron, Ohio; The Firestone Tire and Rubber Company of Akron, Ohio, the B. F. Goodrich Company of Akron, Ohio, and the Pennsylvania Rubber Company of Jeanette, Pennsylvania. ³⁰

XXIX. This defendant denies that the complainant has given it notice of either of said patents, or of his alleged rights under either of them, but says that defend- ⁴⁰

Amended Answer.

ant has been, for a period of between two and three years, commercially exploiting tire making machines of one type only; and, upon information and belief, that this commercial exploitation has been well known to the complainant herein, but that said complainant, for the purpose of deceiving this defendant and leading it to believe that the complainant did not claim that the machines exploited
 10 by this defendant were an infringement of any of complainant's rights, has deliberately failed to notify this defendant of the complainant's rights alleged in the Bill of Complaint or any thereof, and that defendant has been misled thereby; wherefore this complainant is now estopped by this conduct and his laches from maintaining this suit against this defendant.

XXX. This defendant denies that it has at any time within the District of New Jersey or elsewhere in the
 20 United States, made or used machines containing the inventions of either or both of said alleged patents or of any of the above noted claims thereof; or that it has realized any profits or advantages which would otherwise have accrued to complainant, or that it is continuing or threatening to continue the manufacture or use any of such machines; or that by its acts, the complainant has been or is being caused any damage whatsoever.

30 WHEREFORE this defendant denies that the complainant is entitled to an injunction, either provisional or permanent, against it, or to an accounting of profits or damages, or to costs, or to any relief whatsoever; and prays that the Bill be dismissed with costs to this defendant.

THE JOHN E. THROPPS' SONS CO.,

E. CLARKSON SEWARD

Defendant's Solicitor

E. CLARKSON SEWARD

Of Counsel.

IN THE
UNITED STATES DISTRICT COURT,
DISTRICT OF NEW JERSEY.

FRANK A. SEIBERLING,
Plaintiff,

vs.

THE JOHN E. THROFF'S SONS COMPANY,
Defendant.

In Equity
No. 614.

10

Plaintiff's *Prima Facie* Proofs.

Transcript of proceedings on final hearing, before
EDWARD O'BYRNE, Esq., Examiner, at the office of Rogers,
Kennedy & Campbell, 15 Broad Street, New York City,
beginning March 24th, 1919. 20

APPEARANCES:

For Plaintiff, ROBERT FLETCHER ROGERS, Esq.

For Defendant, E. CLARKSON SEWARD, Esq.

30

Mr. Rogers introduces in evidence a certified copy of
U. S. Letters Patent No. 941,962, issued upon an applica-
tion of Will C. State on November 30, 1909, to Frank A.
Seiberling, plaintiff herein, together with a copy of the
grant to plaintiff, and a copy of the disclaimer filed by
plaintiff on February 14th, 1919; the same being marked
"Plaintiff's Exhibit No. 1, Patent in Suit".

Mr. Rogers also states that with the consent of counsel 40

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he introduces in evidence a certain tire-making machine, not here present, but understood to be in the Court House of the U. S. Circuit Court of Appeals for the Sixth Circuit at Cincinnati, Ohio, said machine being an exhibit in the Firestone case; the same being marked "Plaintiff's Exhibit No. 2, State Machine".

Mr. Rogers also states that with the consent of counsel
10 he introduces in evidence a copy of U. S. Letters Patent No. 1,119,326, issued upon an application of John E. Thropp, Peter D. Thropp and Albert De Laski, on December 1, 1914; the same being marked "Plaintiff's Exhibit No. 3, Patent on Defendant's Machine".

Mr. Rogers also refers to the exhibition on March 18, 1919 at Trenton, New Jersey, of one of defendant's carcass-making machines; in this connection Mr. Seward states that this machine in construction and mode of operation is substantially the same as the machines manufactured and leased by defendant prior to the filing of the
20 Bill of Complaint herein, and that it is his intention later on to introduce it in evidence as "Defendant's Machine".

Whereupon, ARTHUR S. BROWNE, being duly sworn, does depose and say, in answer to interrogatories propounded to him by Mr. Rogers, as follows:

Q. 1. Please state your name, residence and occupation.

30 A. Arthur S. Browne, Washington, D. C., patent solicitor and expert.

Q. 2. Will you kindly state your experience and training that qualify you, as you believe, to give testimony as to mechanical matters in this cause.

A. I was graduated from Dartmouth College in 1881 and the following year entered my present profession in which I have since been actively and continuously engaged. I have prosecuted many hundreds of applica-
40 tions for patents and have testified as an expert witness

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in more than five hundred patent suits in the United States and other courts.

I have been familiar with the subject of pneumatic tires, since the same were first introduced on bicycles some thirty years ago and subsequently on their adoption and use on automobiles. I have testified in several patent suits in which pneumatic tires both for bicycles and for automobiles have been involved, and in which it has been necessary for me to familiarize myself with the history of the art and to become familiar with the conditions surrounding their use. I have also become familiar with the action of such tires on automobiles both in the use of my own car and from the observation of cars other than my own. 10

I have made a special study of the manufacture of tires by the machine of the patent in suit. On several occasions I have visited the factory of the Goodyear Tire & Rubber Company at Akron, Ohio, for the special purpose of familiarizing myself with the construction and mode of operation of machines made in accordance with the patent in suit. 20

I have also examined the machine of the defendant herein which was exhibited to me and others in Trenton, N. J. on March 18, 1919.

Q. 3. I take it from your last answer that you have read the patent in suit No. 941,962. Will you state whether or not you think you understand the same? 30

A. I have read and understand the State patent in suit.

Q. 4. And is this last answer of yours intended to cover also the disclaimer filed on the 14th day of February, 1919?

A. It does.

Q. 5. I understand you to say that you have seen defendant's machine in operation. Did that machine bear 40

Minnesota

St. Paul, Minn.

Arthur S. Browne for Plaintiff—Direct.

any patent plate or otherwise indicate that it was built under existing patents?

10 A. The defendant's machine which I examined bore a plate having two patent dates, namely, December 1, 1914 and April 27, 1915. The patent date of December 1, 1914 is that of U. S. Letters Patent 1,119,326 granted to the De Laski & Thropp Circular Woven Tire Company of Trenton, N. J., assignee of John E. Thropp, Peter D. Thropp and Albert De Laski. The machine which I saw also had a plate on it stating that John E. Thropp's Sons Co. is a licensee of the De Laski and Thropp Circular Woven Tire Company.

Q. 6. Will you state whether or not the patent you thus specifically refer to presents a machine at all corresponding to defendant's machine as you saw it.

20 A. This Thropp & De Laski patent substantially illustrates the defendant's machine which I examined.

This patent in its principal figures illustrates an electric motor for driving each of the two fabric forming rolls. In a modification illustrated in Figs. 14 and 15 it illustrates fabric forming rolls which are not driven by independent electric motors but which are rotated solely by frictional engagement with the fabric applied to the rotating core. The defendant's machine which I examined is in this respect like the modification of Figs. 14 and 15
30 of the patent and it does not have electric motors for driving the fabric forming rolls.

Also, this patent illustrates in Fig. 2, two cones 25 and 26 connected by an adjustable belt by means of which the speed of the machine as a whole is varied. This particular speed changing drive was not on the defendant's machine which I examined.

With these two exceptions, the defendant's machine which I examined is substantially that disclosed in the
40 Thropp & De Laski patent 1,119,326. There are some

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mechanical differences which are unimportant so far as the organization and mode of operation are concerned.

Q. 7. Have you ever seen a carcass-making machine substantially like that presented in the State patent in suit?

A. Yes, I have seen a number of such machines at the plant of the Goodyear Tire & Rubber Company, at Akron, Ohio, and I also saw one of these machines at the U. S. Court House in Cincinnati, Ohio, which was operated on the occasion of an argument in a suit against the Firestone Company before the Circuit Court of Appeals of the Sixth Circuit.

Q. 8. Will you kindly explain to the court the construction presented in the State patent in suit and more particularly with reference to the means for shaping or forming the fabric to the sides of the core, comprising generally the rotatable core, the slow speed mechanism, the fast speed mechanism, the speed changing devices, and the forming- or so-called spinning-rolls, together with their operating means. In this connection you may refer also, if you like, to the Goodyear machines which you have inspected in order to illustrate the construction and mode of operation.

A. At the outset the State patent in suit, No. 941,962, of November 30, 1909, says:

“My invention relates specifically to the manufacture from flat sheets of rubber-coated canvas of the open-bellied casings or more briefly the open casings or tire-shoes which are used in connection with an inflatable inner rubber tube to constitute the double-tube pneumatic tires now used on automobiles and the like.” (P. 1, lines 8 to 15.)

The casing or tire-shoe is composed of several superposed layers of duck or canvas impregnated or coated

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with rubber compound, this portion of the tire being commonly referred to as the "carcass". This carcass has applied to it beads at the sides, covering strips, and a tread, and the tire is subjected to a vulcanizing process. The State patent in suit is for a machine, the purpose of which is to manufacture the carcass composed of the several layers of canvas or duck. It is upon this carcass that
10 the strength and durability of the tire depends.

The canvas used is in the form of flat strips of material which it is necessary to bring into the shape required for the tire. The State patent in suit specifically illustrates a duplex machine by means of which two like operations can be carried out at the same time. It is important to consider only one-half of the machine as the other half is a duplicate. The patent illustrates in Fig. 2 a detachable ring-core 115, and sections of different forms of this
20 ring-core are illustrated at 136 in Fig. 9 and in Figs. 12, 12^a, 12^b and 12^c. The shape of this core is that of the interior of the finished tire. The object of the machine of the State patent is to form and shape the flat strips of canvas or duck so that the first layer of canvas shall exactly and smoothly fit the contour of the core and so that each successive layer of canvas may be smoothly shaped and formed to fit the layer of canvas previously applied.

The core at its periphery is of a greater diameter and
30 circumference than at any other portion, while at its base it is of smaller radius and circumference. Hence, it is obvious that a strip of canvas long enough to extend around the periphery of the core would be much longer at its edges than the circumference of the core at the base. To take a flat strip of canvas and wind it around the core and lay it down on the sides of the core would necessarily involve the gathering and puckering of portions of the fabric, except that portion which surrounded the core at
40 its periphery. The problem, therefore, is so to shape and

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form the flat sheet of fabric that it will accurately and smoothly conform to the core.

The State specifications says:

“My machine comprises a power-driven ring-core in connection with a pair of stock-rollers which have wound thereon strips of canvas skim-coated with rubber and cut on the bias.” (P. 1, lines 28 to 32.) ¹⁰

I produce a diagram illustrating the arrangement of threads in a strip of canvas so cut on the bias and I have designated this diagram “Original Flat Fabric Before Shaping”.

As shown in this diagram, the crossing threads of the fabric (which are known as the “weft” and “warp” threads in the textile art) cross each other at right angles; but by reason of the way in which the canvas is cut, each thread whether warp or weft in the flat fabric extends at an angle of 45° to the length of the fabric strip. A strip of fabric so cut on the bias can be stretched either longitudinally or laterally to a substantial extent without weakening the threads. Such a stretching of the fabric will elongate the square reticulations of the fabric and will make them diamond or lozenge shaped. And by such stretching longitudinally and laterally the flat fabric may be made to conform to the contour of the core. ²⁰

As illustrated in the diagram “Original Flat Fabric Before Shaping”, the middle of the fabric can be stretched longitudinally so as to be shaped to the periphery or middle zone of the core. Such stretching will be of the maximum extent at the central line of the middle zone or tread portion of the core and on each side of this middle line the extent of stretch is less and less until the circumferential lines of the core through their decreasing diameters are of the same length as the original fabric. The lines where no stretch of the fabric occurs are indi- ³⁰ ⁴⁰

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10 eated at the places designated "median line" in the diagram. This leaves the outer portions or "skirts" of the fabric beyond the median lines which are not stretched at all and which are far from conforming to the inner portions of the sides of the core. These skirts of the fabric can then be stretched laterally or in the direction of the radius of the core, thus elongating the squares of the fabric in a direction at right angles to the lengthwise elongation. In this way the skirts of the fabric are radially stretched and are circumferentially contracted with the result that the skirts of the fabric as well as the middle portion are made to fit snugly and without wrinkles over the core.

20 This effect is illustrated in a second diagram which I now produce and which is marked "Fabric Shaped to Core". This shows a portion of a sheet of fabric applied to a core, and also illustrates on a larger scale in small figures at the right the effect produced upon the crossings of the threads of the fabric. As indicated in this diagram, the threads at the tread zone are elongated circumferentially so that the original square reticulations are converted into diamonds or lozenges, the long dimension of which is circumferential. At the median zone the fabric is not stretched either longitudinally or radially and accordingly the threads cross each other at the original right angles, as indicated at the small figure marked
30 "Median zone". Between the central tread line and the median zone the reticulations of the fabric gradually change in shape from the pronounced circumferentially elongated diamonds at the tread zone to the squares at the median line.

In this diagram, I have indicated the edge of the fabric by the word "bead", since it is near the edge that the bead of the tire (by means of which it is anchored to the rim of the wheel) is applied. At this bead edge
40 the reticulations of the fabric are elongated laterally with

Arthur S. Browne for Plaintiff—Direct.

respect to the fabric or radially with respect to the core to the maximum extent, as indicated in the small figure designated "Bead Zone". As here shown, the long dimension of each diamond or lozenge formed of the crossing threads is elongated radially and is foreshortened circumferentially. Between the median line and the bead edge of the fabric the reticulations of the fabric gradually pass from the square shape at the median line to the radially 10 elongated diamonds at the bead line, the successive reticulations being elongated radially and contracted laterally so as to fit the particular portion of the core which they overlie.

The State specification says:

"Heretofore such open-bellied or open tire-shoes in so far as they have been made direct from sheeted fabric have been made by hand." (P. 1, lines 15 to 18.)

20

The flat sheeted fabric can be stretched by hand circumferentially to conform to the tread portion of the core and laterally below the median line to conform to the sides of the core, subject to lack of certainty and uniformity inevitable in such hand manipulation, which is dependent upon the skill of the workman.

The State patent discloses a machine so organized or constructed that this work of shaping the flat fabric to the core is done with uniformity, accuracy and rapidity. 30 In this connection the State patent says:

"I may say in conclusion that whereas an operator can make seven or eight tires a day by hand, he can make from forty to sixty a day by my machine and make them better than they can be made by hand." (P. 7, lines 46 to 50.)

The characteristics of the machine of the State patent to which the question refers are chiefly those which are 40

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utilized in shaping the skirts of the fabric to the sides of the core below what I have marked as the medium line or zone in the diagrams which I have produced. However, before the skirts of the fabric can be shaped to the sides of the core the fabric must be first properly applied to the peripheral or tread portion of the core.

10 Fig. 1 of the patent illustrates four rolls of fabric, two of these rolls being employed in connection with each of the ring-cores. The purpose of having two rolls of fabric is in order that superposed layers of canvas on the ring-core will have their sets of threads cross in alternation. The fabric from each supply or stock roll on its way to the ring-core passes around rollers, as indicated in Fig. 2, one of which is a tension roller to which tension is applied by the mechanism illustrated in Fig. 7, and the leading end of the fabric is cemented to the core as illustrated in Fig. 2. The core is then slowly revolved, thereby drawing off the fabric under tension from its supply roll and thereby giving the desired uniform longitudinal stretch to the middle portion of the fabric which is engaged by the outer periphery or tread zone of the core. The specification says that

20

“I apply the canvas to the power-driven ring-core while thus moving quite slowly, say at six revolutions a minute.” (P. 2, lines 1 to 4.)

30

The core is rotated slowly by power until a single layer of fabric has been passed completely around it. Then the core is stopped and the canvas is severed by the workman who fastens the last end of the canvas so as to slightly overlie the leading edge, the rubber compound with which the canvas is provided ensuring the adhesion of these overlying ends.

At this stage the fabric is stretched at its middle so
40 as to conform to the tread zone of the core and its mar-

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gins or skirt portions are unattached and are no longer flat, but are in a loose, baggy condition.

The machine of the State patent is provided with speed changing mechanism, illustrated in Figs. 3 and 4 and described in the specification, beginning at line 115, page 3. After a layer of fabric has been applied to the core the speed changing mechanism is brought into action and the ring-core is rotated at high speed by power during 10 the subsequent action of the smoothing, shaping, forming or spinning-rolls.

In this connection the specification says:

"I have discovered, however, that it is not only possible but highly desirable to let the smoothing- and spinning-rolls operate upon the ring-core while this is moving at a much higher speed, say at two hundred and seven turns a minute. By this means the machine not only does more work in a given 20 time but it does better work." (P. 2, lines 4 to 11.)

Before referring to the spinning-rolls which shape and form the skirts of the fabric to the sides of the core smoothly, uniformly and accurately, I will call attention to the tread-forming roll 141 shown in Fig. 12^a. The tread-forming-roll is brought to bear upon the middle portion of the fabric applied to the ring-core while the ring-core is rotated at its fast speed. In this connection 30 the specification says:

"In the case of the tread-forming-roll 141, this permits the operator to gradually bring the proper amount of pressure to bear on the canvas either which lies under or which actually forms the tire tread to thoroughly smooth it and shape it to the core." (P. 5, lines 54 to 60.)

While the core is rotating at its fast speed, the skirts of the fabric are applied, cemented, shaped and formed 40

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to the sides of the core by means of the forming- or spinning-rolls 147, best shown in Figs. 9, 12^b and 12^c. There is a pair of these spinning-rolls which simultaneously act upon opposite sides of the core, and upon the respective skirts of the fabric, as illustrated in these figures, so that both skirts of the fabric are simultaneously applied and shaped to the core. These forming-
10 or spinning-rolls are supported by a sliding carriage which is movable radially with respect to the rotating core. This carriage is moved inwardly by a screw feed so that the forming- or spinning-rolls are gradually fed inwardly as the core rotates. Also, each forming- or spinning-roll is pressed toward the core so as to press forcibly upon the portion of the fabric which it bears against.

The sliding carriage for the forming- or spinning-rolls
20 is shown at 123 in Fig. 6. It is mounted to slide radially with respect to the core upon the housing or standard 118. It is gradually advanced by a feed screw controlled by a hand-wheel 124. The workman turns this hand-wheel and thereby gradually feeds the carriage for the forming- or spinning-rolls radially inward.

The forming- or spinning-rolls are not directly carried by the sliding carriage, but are mounted upon a rotatable head or turret 131, shown in Fig. 9, which turns on the sliding carriage. As shown in Fig. 9, this rotatable head
30 or turret not only carries the forming- or spinning-rolls, but also the tread-roll 141, bead-applying-rolls 156, 158, and trimming cutters 149. By turning the turret any one of this set of tools can be brought into co-action with the core. The turret is locked in any one of its positions on the sliding carriage by the locking mechanism illustrated in Fig. 8.

As shown in Fig. 9, each forming- or spinning-roll 147 is rotatably mounted on one end of a lever pivoted at
40 143 to the turret. Each of these levers is acted upon by

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a spring 145 which presses the corresponding forming- or spinning-roll against the fabric on the core. Concerning these springs the specification says:

“The spinning-rolls are also shown as spring-pressed toward the plane of the ring-core by springs 145, here shown, diagrammatically, as leaf springs although, in practice, strong spiral springs may be 10 used.” (P. 5, lines 108 to 113.)

The specification further states that weights can be substituted for the springs, in which connection it says:

“And it is of course understood that there may be substituted for the springs and as an equivalent therefor the more cumbersome device of a weight constantly tending to force the spinning-rolls, with considerable pressure, toward the ring-core.” (P. 5, 20 lines 121 to 127.)

Indeed, the spinning-rolls may be pressed toward the core in other ways, the specification saying:

“In a broader aspect of my invention, however, I may employ mechanical instrumentalities, not the hands of the operator, other than springs or weights for pressing the spinning-rolls laterally against the ring-core. I shall, then, use the term ‘power-pressed’ 30 to cover generally not only springs and weights but other mechanical instrumentalities for pressing the spinning-rolls against the ring-core. When I refer to my spinning-rolls as laterally yielding and no more, I mean to include any source of power for pressing the spinning-rolls against the ring-core, even the comparatively inefficient and irregular power contained in the hands of the operator.” (P. 6, lines 2 to 17.)

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As shown in the drawings, each forming- or spinning-roll has a rounded working edge, and concerning this the specification says:

10 “While I have shown these spinning-rolls as disk-shaped throughout, it will naturally be understood that the disk-like or narrow character of the rolls is only essential at the periphery which is rounded and not sharp so as not to cut the fabric.” (P. 6, lines 17 to 23.)

20 As I have previously pointed out, after the flat fabric has been stretched upon the slowly rotating ring-core and cemented thereto along the tread zone, the ring-core is then rotated at a high speed, the specification giving as an illustration two hundred and seven turns a minute. The effect of this high speed is to throw out the unattached sides or skirts of the fabric by centrifugal force, somewhat as indicated in Figs. 12^a and 12^b of the patent drawings. The result is that the skirts of the fabric are projected outwardly in a stiff and smooth condition, thereby eliminating any tendency to fold, gather, pucker or wrinkle. The forming- or spinning-rolls are then brought into action and each roll initially presses and acts upon the hinge of the corresponding skirt. That is to say, the fabric adheres to the tread zone of the core at each side and the unattached portion of the fabric
30 is thrown out by centrifugal force at the line where the adherence between the fabric and the core ceases, and this line constitutes a hinge on which the outstanding skirt turns. It is at this hinge line that the effective action of each forming- or spinning-roll takes place. As shown, for example in Fig. 12^b of the patent, each forming- or spinning-roll presses against the fabric at this hinge line, thus forcing the area of the fabric with which it is immediately in contact against the core and causing
40 it to adhere thereto. The unattached skirt is forced

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outwardly by centrifugal force in opposition to the inward pressure of the forming- or spinning-roll. The effect is as though the margins of the skirt were being pulled outwardly by invisible fingers against whose pull the spinning-rolls must act in forcing the fabric at the hinges against the core. The cementing or adhesive action of the rubber compound in the fabric, as the fabric is forcibly pressed against the core, causes the fabric to adhere to the core so strongly that the centrifugal force cannot detach the fabric when once it has adhered to the core. 10

As the core rapidly rotates, the forming or spinning-rolls are fed gradually inwardly with the result that each spinning-roll traces a spiral path with respect to the core and the fabric thereon. By reason of the rapid rotation of the core and the gradual progressive advance of the spinning-roll, the successive convolutions of this spiral path may be brought so close together that each spinning-roll can act successively only upon small or elemental areas of the fabric. Assume, for example, that at each rotation of the core the spinning-rolls are fed inwardly one-eighth of an inch, then each spinning-roll, as the ring-core advances, acts successively on portions of the fabric extending radially only one-eighth of an inch beyond the hinge line between the adhering portion of the fabric and the outwardly flying skirt; and circumferentially to the extent which the periphery of the spinning-roll is in contact with the fabric. Accordingly the action for each spinning-roll is to fold down against the core successive small areas of the fabric. The pressure exerted by each spinning-roll upon this area of fabric causes it to adhere to the core as it is folded against the core and owing to the adhesive property of the rubber compound, the centrifugal force is not sufficient to detach it. 30

In this way, each spinning-roll acts progressively both circumferentially and radially to fold small successive 40

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areas of fabric at its hinge line against the core until the entire skirts are laid snugly, smoothly, uniformly and accurately against the side surfaces of the core to which the fabric should conform.

During this folding action, the centrifugal force acting in opposition to the inward pressure of the forming- or spinning-rolls maintains the unattached portions of the skirts smooth and wrinkle-free, with the result that the formation of wrinkles in the applied fabric is prevented.

Since the action of each spinning-roll on the fabric is predominantly circumferential, owing to the gradual progressive radial advance, the radial component of movement of each spinning-roll is small as compared with the circumferential advance of the core, it might even seem as though the effect would be to stretch the fabric circumferentially and not radially (just the opposite of what is desired), nevertheless the fact is that the fabric is stretched radially and not circumferentially. That is to say, the ultimate effect is that shown in my second diagram, "Fabric Shaped to Core", namely, that at each inner margin or bead zone the reticulations of the fabric are converted into diamonds or lozenges, the long diameter of which is radial and the short diameter circumferential. The characteristic features of the action of the machine in attaching the skirts of the fabric smoothly to the sides of the core, after the initial circumferential stretch, may be recapitulated as follows:

1. *Centrifugal force* due to the high speed of the core which holds the skirts of the fabric under tension away from the core in a stiff and smooth condition and in a direction lateral to the plane of rotation of the core, said tension being sufficient to produce radial stretching when each skirt is acted upon by the forming- or spinning-roll.

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2. *The progressive advance* of the forming- or spinning-rolls which establishes one base or hinging line along one portion of its spiral path and then a new base or hinging line along the next portion of the spiral until the sides are finished.

3. *The hinging or folding action* of the fabric over such small areas that the fabric will contract circumferentially and be laid down wrinkle-free along the zone of the narrow advance. 10

4. *The cementing or adhesive action* of the rubber compound which holds the fabric firmly to the core when once strongly pressed thereagainst.

The ultimate effect is the re-arrangement of the threads or cords of the fabric so that all portions of the fabric are smoothly and uniformly attached to the core. 20

The machine of the State patent in suit is so organized and constructed that a previously unshaped, flat fabric strip from a supply or stock-roll is uniformly stretched at its middle or tread portion upon a ring-core when rotating at the power-driven slow speed. After this middle or tread portion has been applied, the ring-core is rotated at high speed by the power-drive mechanism of the machine. During this high speed rotation, the fabric is shaped and applied to the ring-core beyond the tread portion at each side. The effect of the high speed of the ring-core is to throw out from its sides by centrifugal force the unapplied fabric portion. The forming- or spinning-rolls are carried by a support which is so mechanically mounted and fed as to ensure its radial movement with a gradual progressive advance in proper relation to the fast rotating ring-core. The forming- or spinning-rolls are pressed against the ring-core during such gradual radial advance, so that each spinning-roll 40

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acts gradually upon the centrifugally thrown-out fabric, thereby shaping it to the side of the rotating ring-core while bringing the fabric into adhesive contact therewith.

There is one specific feature of the machine of the State patent in suit which I have not yet mentioned. As shown in Figs. 9, 12^b and 12^c, the plane of rotation of each forming- or spinning-roll is not perpendicular to the plane
10 of rotation of the ring-core, but is at a receding angle thereto. Concerning this the specification says:

“It will be noted finally that I mount the spinning-rolls with their plane not at a right angle to but to recede at an acute angle from the plane of the ring-core. The effect is when the ring-core is rotating at high-speed, the centrifugal force tends to throw the fabric out at a right angle from the core-plane and unless the roller recedes in the
20 manner shown, the fabric will become entangled with it.” (P. 6, lines 33 to 42.)

The machines which I have seen in use at the Good-year Tire & Rubber Company's factory at Akron, Ohio, so far as relates to the fabric supply, the high and low speeds, the speed changing mechanism, the spinning-rolls, and the gradually fed support or carriage for said rolls, are organized and constructed in all substantial respects
20 like the machine illustrated in the State patent in suit, and act in the same way. The same is true of the similar machine which I examined and witnessed in action at the United States Court House in Cincinnati, Ohio, on the occasion of the hearing before the Circuit Court of Appeals, in the Firestone suit.

[The two diagrams referred to by witness are introduced in evidence and entitled, respectively, “Plaintiff's Exhibit No. 4, Original Flat Fabric Before Shaping”, and
40 “Plaintiff's Exhibit No. 5, Fabric Shaped to Core”.]

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Q. 9. Referring now to defendant's machine as exhibited to you on March 18, 1919, will you kindly compare its construction and mode of operation with the construction and mode of operation of the State patent and State machine as set forth by you in your last answer. You may, if you please, refer in this connection to the disclosure given in the Thropp & DeLaski Patent No. 1,119,326 you have already referred to. 10

A. I will use the Thropp & DeLaski Patent No. 1,119,326, December 1, 1914, in describing the defendant's machine, and when I use reference numerals they will be those of this patent.

Defendant's machine has a rotatable ring core 104 which is detachably mounted upon one end of a rotating shaft shown at 8 in Fig. 2 of the drawings of said Thropp & DeLaski patent. This shaft is power driven, and there is a speed changing mechanism which enables the core to be driven in succession at low and high speed. This speed changing mechanism is illustrated in Fig. 2 and is described in detail beginning at line 83 page 1 of the Thropp & DeLaski patent. 20

I timed the two speeds of the defendant's machine which I examined. The high speed was in excess of 120 revolutions per minute, approximately 125 r.p.m. The low speed was one-tenth of the high speed.

The ring-core is driven at low speed during the initial application of the tire fabric; and it is rotated at high speed during the action of the forming- or spinning-rolls. 30

As shown in the Thropp & DeLaski patent, the flat tire fabric comes from a supply roll 66. The fabric passes from the supply roll 66, as shown in Fig. 7, around the guide roll 71, over tension roll 68, thence under a second guide roll 69 to the ring-core against which the leading end of the fabric is pressed. The fabric is impregnated or coated with an adhesive rubber compound so that the leading end adheres to the core. The rotation of the ten- 40

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sion roll 68 is retarded by a brake band 73 (Fig. 2). Accordingly, as the ring-core slowly rotates, it pulls off the fabric from the supply roll against the resistance of the tension roll, with the result that the fabric is stretched uniformly longitudinally at the middle or tread zone of the ring core.

After one complete revolution of the ring-core, the machine is stopped and the workman overlaps the last end of the fabric strip over the leading end.

Thus at the conclusion of the slow speed rotation the middle of the fabric is stretched upon the tread zone of the core, conforming to the shape thereof, and adheres to the core. The skirts or side portions of the fabric are unattached, loose and baggy. The workman then shifts the speed changing mechanism so that the core is driven at high speed. This speed is such that the unattached skirts of the fabric are thrown out stiffly and smoothly by centrifugal force. Each unattached skirt swings outwardly at the hinge between it and the attached middle portion of the fabric.

The outlying skirts of the fabric are then acted upon by the forming or spinning rolls 132. As I have heretofore stated, these forming or spinning rolls are mounted in the manner shown in Figs. 14 and 15 of the Thropp & DeLaski patent. As therein shown, each roll 132 is rotatably mounted in a bracket 129 carried by a curved plate 122, which is capable of sliding in a curved path upon a lever 97, being locked to that plate by screw 125. Each lever 97 is pivoted at 98 to a sliding carriage 85. This carriage 85 is mounted to slide radially with respect to the core upon a supporting guideway 83. This carriage 85 is fed gradually and progressively inward by means of a feed screw 86, which is best shown in Fig. 5. This feed screw can be turned by a hand-wheel 88, but as I witnessed the defendant's machine in operation, the feed screw was rotated automatically by the power drive mechanism,

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such as illustrated and described in the Thropp & DeLaski patent.

Each forming- or spinning-roll 132 when in action is forcibly pressed toward the ring-core and against the fabric applied thereto by means of a weight 103, best shown in Fig. 5. Accordingly, as the ring-core rapidly rotates and the forming- or spinning-roll carriage is gradually advanced, each spinning-roll is forcibly pressed upon 10 one skirt of the fabric at the hinged line between said outlying skirt and the attached portion of the fabric.

The consequence is that the inwardly pressing forming- or spinning-rolls act in opposition to the pull of the fabric skirts under the action of centrifugal force. As the ring-core rotates rapidly and the forming- or spinning-rolls feed gradually inward, each roll traces a spiral path on the fabric, the successive convolutions of this spiral path being close together, about one-sixth of an inch apart as 20 nearly as I could estimate.

Accordingly, each forming- or spinning-roll acts successively upon small areas of the outlying fabric skirt, folding the same down at the hinge line against the core and causing by pressure each successive area to adhere to the core, due to the adhesive property of the rubber compound. This adhesion is adequate to retain the fabric against the outward pull of centrifugal force.

This action continues until the skirts of the fabric are shaped and formed to the sides of the core and are caused 30 to adhere thereto.

Each forming- or spinning-roll 132 has a rounded working edge. Also, as shown in Fig. 14, which illustrates the normal position of the forming- or spinning-rolls relatively to the ring-core, the plane of each forming- or spinning-roll is at a receding angle to the plane of rotation of the ring-core, so that the outlying fabric skirts do not conflict with the rolls.

In the respects to which I have referred, the defend- 40

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ant's machine is similar to the machine of the State patent in suit.

10 In both machines there is a ring-core driven by power first by a low speed mechanism and then by a high speed mechanism. In both machines there is a speed changing mechanism to enable the machine to be power driven at the two different speeds. In each machine the previously unshaped fabric strip is first stretched along its middle or tread portion onto the ring-core when such ring-core is rotating at slow speed.

Thereafter in each machine the skirts of the fabric beyond the tread portion are shaped to the sides of the ring core by means of the forming- or spinning-rolls. In each machine during the action of the forming- or spinning-rolls, the ring core is rotated at so high a speed that the skirts of the fabric are thrown stiffly and smoothly outward by centrifugal force.

20 In each machine the forming- or spinning-rolls are mounted upon a support or carriage which is in turn so mechanically mounted on the machine as to insure the radial movement of the forming- or spinning-rolls with a gradual advance in proper relation to the fast rotating ring core. During such gradual advance, each forming- or spinning-roll in each machine is pressed toward the core and it acts gradually upon the centrifugally thrown-out fabric to shape it to the side of the rotating ring-core
30 by bringing it into adhesive contact therewith.

In each machine the effect of each forming- or spinning-roll is to form or shape the portion of the fabric acted upon by it to the side of the core, the reticulations of the fabric being elongated radially and contracted circumferentially.

Mechanically considered, the defendant's machine resembles the State patent in the following respects:

40 There is a rotating power driven ring-core. There is a low speed mechanism, a high speed mechanism, and

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speed changing mechanism, so that the ring-core may be power driven both at low speed and at high speed.

There is a stock roll for the unformed flat sheet fabric and tension mechanism between the stock roll and the ring-core, so that the sheet fabric can be uniformly stretched circumferentially when applied to the ring-core.

There are two forming- or spinning-rolls which simultaneously act upon the opposite sides of the ring-core and against the hinges of the sides of the fabric where the 10 unattached portions join the attached portions.

Each forming or spinning roll is carried by a swinging arm and is forcibly pressed against the fabric upon the core. Defendant gets this pressure by means of a weight, and while the State patent shows a spring for this purpose, it specifically says that a weight may be used.

The spinning-rolls are mounted upon a sliding carriage. This sliding carriage is mechanically mounted and accurately guided upon the machine so as to move radially 20 with respect to the ring-core.

The sliding carriage is fed by a screw so that it is gradually and progressively advanced as the forming- or spinning-rolls press against the rapidly rotating ring-core.

Each spinning-roll has a rounded working edge.

Each spinning-roll is set at a receding angle with respect to the ring-core.

The forming and shaping of the skirts of the fabric 30 at the sides of the core and the cementing of the fabric to the core in a smooth and unwrinkled condition are effected in the same way, both in the machine of the State patent and in the defendant's machine.

In the defendant's machine, as in the machine of the State patent, the skirts of the fabric are held stiffly and smoothly away from the core by centrifugal force, and under tension sufficiently to produce a radial stretching when acted upon by the spinning rolls; each forming- or 40

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spinning-roll progressively advances in a spiral path, thereby establishing successive base or hinge lines where the outlying fabric skirts join the attached portion of the fabric; the fabric is successively folded down at small areas against the core so that the fabric contracts circumferentially and is laid down wrinkle-free along the zone of the narrow advance of the forming- or spinning-
10 rolls; and due to the cementing or adhesive action of the rubber compound, the fabric is held firmly to the core when once strongly pressed thereagainst.

The ultimate result is to rearrange the reticulations of the fabric uniformly throughout the circumference of the tire, with the long dimensions circumferential at the tread zone and the long dimensions radial at the bead zone.

20 Q. 10. You may state whether or not you observed in defendant's machine any points of construction or operation different from those in the State patent and machine.

A. Yes, I noted a number of differences to which I will call attention.

In the defendant's machine the head which carries the fabric stock roll is vertically adjustable and the stock rolls are directly above the ring-core.

Defendant's machine does not use any tread roll like that shown at 141 in Figs. 9 and 12^a of the State patent.

30 In defendant's machine there is an automatic feed for the carriage which supports the forming- or spinning-rolls, whereas in the State machine the feed screw is turned by hand. But the defendant's machine does have a hand-wheel by means of which the feed screw for the roll carriage can be fed.

Defendant's machine has an automatic stop motion which is arranged so that it can stop the advance of the forming roll carriage at any desired place.

40 Defendant's machine has an adjustable pointed gauge to indicate to the workman that the forming rolls have

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reached a position where it may be desirable to have the advance of the carriage stopped.

In defendant's machine, as shown in Fig. 14 of the Thropp & DeLaski patent, the supporting plates 122 for the forming- or spinning-rolls are movable in a curved path so that the rolls may be adjusted to the position shown in dotted lines, or to any intervening position. This enables the plane of rotation of the rolls to be 10 changed relatively to the plane of rotation of the core.

The swinging levers 97 shown in Fig. 14 of the Thropp & DeLaski patent and used in defendant's machine, have outwardly projecting arms 108 each with a set screw 118, by means of which each lever can be connected to a rod 110. Each of the two rods 110 is pivoted to a wheel 111 which can be turned by a screw 114 on the hand rotated shaft 115. By clamping the set screws 118, the levers 97 can be swung by hand. This enables the work- 20 man to move the forming or spinning rolls away from the core and also enables the workman to press the forming- or spinning-rolls by hand power against the fabric layers upon the ring-core.

In the State machine the levers carrying the forming or spinning rolls are mounted upon a turn table or turret revolving on the carriage, this turn table also carrying bead forming rolls and trimming cutters, as well as the tread forming roll.

Defendant's machine does not have the bead forming 30 rolls; and its trimming cutters, shown at 151 in Fig. 8 of the Thropp & DeLaski patent are mounted upon an independent frame 140 which can be swung in and out of operative position.

Defendant's machine has special detachable bead rings 162, as shown on Sheet 6 of the Thropp & DeLaski patent drawings, and which are clamped to the ring-core before the beads are put in place. The State patent does not disclose any such rings. 40

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In defendant's machine the forming- or spinning-rolls 132 are greater in diameter than the ring-core in cross section, and hence are relatively larger than the corresponding forming- or spinning-rolls of the State patent.

These are the principal features of difference which I have noted.

There are various differences in specific details of 10 mechanical construction to which it seems unnecessary to call attention.

Direct-examination closed.

MARCH 26, 1919.

CROSS-EXAMINATION BY MR. SEWARD.

x-Q. 1. Give the names of the cases relating to the 20 manufacture of tires in which you have testified as an expert.

A. I have forgotten the titles of the cases. One was for the Pennsylvania Rubber Co., and two others were for the Republic Co.

x-Q. 2. Did the cases for the Republic Co. have to do with the non-skid tread?

A. Yes.

x-Q. 3. And in the case for the Pa. Co. for the non- 30 skid tread?

A. No.

x-Q. 4. What did the last named case have to do with?

A. With the clincher type of tire.

x-Q. 5. What sort of a patent was the patent in suit?

A. The patent in suit was one of the early pneumatic bicycle tire patents which the plaintiff endeavored to assert covered all clincher tires used in automobiles.

x-Q. 6. Were any of the tire making machines you saw 40 at the Goodyear plant like the Goodyear machine you saw operated in the Federal Building at Cincinnati?

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A. Yes, so far as concerns the stretching of the tire fabric on the tire and the forming of the sides of the fabric on the rapidly rotating ring core.

x-Q. 7. Were they the same in mechanical structure?

A. No.

x-Q. 8. In the description which you have given of the construction and operation of the machine of the patent in suit, have you been giving your understanding of the patent, as modified by the disclaimer? 10

A. Yes.

x-Q. 9. Do you say that the machine shown in the patent in suit has mechanism for imparting a high rotating speed and a low rotating speed to the core?

A. Yes.

x-Q. 10. Will you please describe the parts which are adapted to give those speeds, referring to the figures of the drawings in which they are shown?

A. As shown in Figs. 1 and 5 of the drawings of the 20 State patent in suit, the machine is driven by a motor 49. This motor has a sprocket wheel 50, around which passes a sprocket chain 51, which likewise passes around a sprocket wheel 52 on a shaft 53. This shaft 53 is utilized to drive the two ring cores with which the machine is equipped, but as these intermediate drives are duplicates, it will suffice to refer to one only of them. The shaft 53 has a sprocket wheel 55, which through a sprocket chain 56 drives a clutch sleeve 57, which is loose 30 on a shaft 58. Splined to the shaft 58 is a sliding clutch sleeve 59, which is under the control of a clutch lever 59', by means of which the shaft 58 may be rotated or stand still at the option of the workman. As shown in Fig. 4, the shaft 58 has a slow worm 76, which meshes with a spiral gear 75, which is loose on shaft 70. Splined to this shaft 70 is a sliding clutch sleeve 71, which can be slid along the shaft 70 by a shifting lever 86. This clutch sleeve 71 has clutch teeth on one side, which are adapted to engage clutch teeth on a sleeve 72, which is 40

fast with the spiral gear 75. When the clutch sleeve 71 engages the sleeve 72, the slowly rotating spiral gear 75 rotates the shaft 70 slowly. The shaft 70 carries a gear wheel 88, shown on Fig. 3. This gear 88, as shown in Fig. 5, meshes with the gear 89 on shaft 90, and it is this shaft 90, as shown in Fig. 1, which detachably carries the ring core. Accordingly in this way the ring core is driven at slow speed, the specification giving six revolutions a minute as an example.

The clutch sleeve 71 also has clutch teeth adapted to engage clutch teeth on a sleeve 73, when the sleeve 71 is moved to the right, as shown in Fig. 3. This sleeve 73 has fast on it a spiral gear 83. Consequently, when the clutch sleeves 71 and 73 are interlocked, the power transmitted through the spiral gear 83 rotates the shaft 70 and hence the ring core. The spiral gear 83 meshes with a worm 82 on a shaft 78, which is driven from the shaft 58 by a sprocket chain 80.

The drawings do not illustrate the face of the worm 82, but it is a high speed worm, since through it rapid rotation is imparted to the shaft 70, the specification giving as an example 207 turns a minute.

x-Q. 11. Have you any authority in the specification or drawings, other than that mentioned by you, for saying that the worm 82 is a high speed worm?

30 A. No.

x-Q. 12. The specification of the patent says does it not, near the bottom of the second column of page 3, "The clutch member 72 is provided with a hub 74 rigidly secured to a spiral gear 75 adapted to be driven by means of a worm 76 mounted on the shaft 58 just as the corresponding clutch member 73 has a hub 84 secured to a spiral pinion 83 driven by a worm 82 on a shaft 78". Does that description indicate that there is any difference in the two worms 76 and 82?

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A. No, that sentence is only a detached part of the description.

x-Q. 13. Please refer to any other part of the description that has to do with the form or relative form of the worms 76 and 82.

A. The very next sentence to the one quoted by you reads:

The shaft 78 is driven from the shaft 58 by a chain¹⁰ and sprocket connection and the arrangement is such that the spiral gear 83 rotates much more rapidly than the spiral gear 75.

Accordingly, it is only a question of such an arrangement of the gearing as to give the speed differential to which the patent repeatedly refers.

Such an arrangement of gearing is well known to all skilled mechanics. Of course, if one pair of gears is to²⁰ produce a slow speed and another pair of spiral gears is to produce a high speed, the skilled mechanic knows that he is to have a slow drive worm in one case and a fast drive worm in the second case.

x-Q. 14. But the patent says nothing about a high speed worm and a low speed worm, does it?

A. No, it leaves that to the intelligence of the mechanic.

x-Q. 15. I call your attention to page 4 of the patent, line 77, where it says in the middle of a sentence "I em-³⁰ploy a slow-speed mechanism, in this case represented by the clutch member 73, and a fast-speed mechanism, here represented by a clutch member 72," and would ask you whether or not your answer is consistent with that statement.

A. No, my answer is inconsistent with this statement, which in turn is inconsistent with the statement at lines 1 to 4, of page 4. The scrivener of the patent at this point has simply got his reference characters wrong. He has⁴⁰

transposed his 72 and his 73. Or, perhaps, his reference characters 83 and 75 are transposed at lines 1 to 4 of page 4.

10 x-Q. 16. You have said that the worm 76 is shown as a slow speed worm, and that the drive of the shaft 70 received from the said worm through the gear 75 and connected parts constitutes the slow speed drive of the shaft 70 and hence of the core. Do you desire to change that answer?

A. No.

x-Q. 17. The shaft 78 is driven from the shaft 58 by the sprocket chain 80. Is that correct?

A. Yes. Consequently, as shown in Fig. 3 because the sliding sprocket wheel 79 is smaller than the driven sprocket wheel on the shaft 78, said shaft 78 rotates somewhat more slowly than shaft 58.

20 x-Q. 18. And the ratio of rotating speed of the shaft 58 to the shaft 78 is about 3 to 2, isn't it?

A. Yes, about that.

x-Q. 19. So that the worm on the shaft 78 is driven more slowly than the worm on the shaft 58?

A. Yes.

30 x-Q. 20. Therefore, is it not a fact, that if a high speed worm were placed on the shaft 78, it would have to compensate for the difference in rotative speed of the shafts 58 and 78 before it could make the gear 83 rotate as rapidly as the gear 75?

A. Yes.

x-Q. 21. The ratio of low speed to high speed mentioned in the specification of the State patent when it refers to the number of revolutions preferred for the low speed and the number for the high speed is about 1 to 34, isn't it?

A. Yes.

40 x-Q. 22. Do you maintain that you could obtain that

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difference in speed from the construction shown in Fig. 3 by employing a high speed worm on shaft 78?

A. Yes.

x-Q. 23. Do you know what would be the pitch of the said worm?

A. It would be about 50 times the pitch of the worm 76.

x-Q. 24. Do you notice that the face of the gears 75 and 83 show substantially the same curve?

A. The illustration of Fig. 3 shows no difference between the worm teeth illustrated, but the showing in this respect is merely conventional and perhaps the draftsman can hardly do more than he has done in making such a conventional illustration of the gearing.

x-Q. 25. If one of the worms had a pitch about 50 times that of the other, would there be a difference in the curvature of the faces of the gears 75 and 83?

A. Yes.

20

x-Q. 26. Can you give any reason why the shaft 78 is driven at a lower speed than the shaft 58 if the shaft 78 is intended to impart the high speed to the shaft 70?

A. No.

x-Q. 27. And I understand you to agree that there is no part of the patent which specifically states that there is any difference in the worms 76 and 82. Is that correct?

A. None, excepting that the specification says that the arrangement is such that the spiral gear 83 rotates much more rapidly than the spiral gear 75, and, therefore, any skilled mechanic would know that the speed difference must be obtained by difference in pitch between the two worms 76 and 82. I note further that the specification says "But when I use the terms fast speed mechanism and slow speed mechanism and speed changing mechanism in the claims, it is understood I mean any class of mechanism accomplishing these functions and not merely the specific mechanism herein shown" (page 4, lines 83-88).

30

40

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Such speed changing mechanism has long been known in the mechanical art.

x-Q. 28. I call your attention to page 4 of the specification, line 8, where it says "By throwing the clutch member 71, which is splined on the shaft 70, into connection with either the clutch member 73 or 72, the shaft 70 is made to revolve slowly or rapidly". Does not that indicate that
10 the clutch member 73 and its gear 83 are part of the slow speed mechanism?

A. No.

x-Q. 29. If the shaft 70 is made to revolve slowly, it makes the core revolve slowly, doesn't it?

A. Yes.

x-Q. 30. In other words, the rotative speed of the core depends upon the rotative speed of the shaft 70?

A. Yes.

x-Q. 31. Will you state what you understand the
20 sentence I have last quoted to mean. That is, the sentence beginning on line 8 of page 4.

A. It means that by the employment of clutch co-operating with the clutch faces on the two spiral gears, either a fast speed or a slow speed can be obtained.

x-Q. 32. But you don't understand it to mean that the slow speed is obtained through the clutch member 73.

A. No, because that is on the spiral gear 83, which
30 the specification has already stated rotates much more rapidly than the spiral gear 75.

x-Q. 33. But you have agreed, I understand, that the scrivener of the patent may have reversed his reference numerals in lines 2 and 4 of page 4. Am I correct in that?

A. Yes, except I think it is much more probable that he has transposed the numerals at lines 79 and 80, since he shows in Fig. 4 that the worm 76 is one of small pitch, which would drive the spiral gear 75 and the shaft
70 slowly.

40 x-Q. 34. Have you seen any machine like that of the

Arthur S. Browne for Plaintiff—Cross.

patent in suit in which the ratio of low speed drive of the core to high speed drive was as great as 1 to 34?

A. No, excepting possibly the machine which I saw in operation at the Courthouse in Cincinnati. As to that, I did not note the ratio of speeds.

x-Q. 35. What was the ratio on the machines of the patent in suit which you examined for that point?

A. I did not observe the exact ratio, but I think it 10 was in the neighborhood of between 10 and 15 to 1.

x-Q. 36. The high speed in the case last mentioned was not over 130 or 135 revolutions per minute, was it?

A. I was informed that the high speed of the Good-year machines is between 120 and 150 per minute, and this accords with my observation of the machines.

x-Q. 37. Do you believe that the said machines, I mean the machines of the patent in suit, would be operative if the core had a high speed rotation of 207 R.P.M. 20

A. Yes.

x-Q. 38. Did you ever make a test to find out if your belief is right or not?

A. No.

x-Q. 39. What do you understand is the function of the tread roller 141 of the patent in suit?

A. The specification says:

In the case of the tread forming roll 141 this permits the operator to gradually bring the proper 30 amount of pressure to bear on the canvas either which lies under or which actually forms the tire tread to thoroughly smooth and shape it to the core. (page 5, lines 54-60.)

I understand this is the function of the tread roll.

x-Q. 40. Then you understand that one function of the tread roller is to shape the fabric to the core, is that correct?

A. Yes. 40

Arthur S. Browne for Plaintiff—Cross.

x-Q. 41. Do you understand that a function of the tread roller is to remove longitudinal wrinkles which may be formed in the fabric on the tread of the core?

A. No. I have never observed any longitudinal wrinkles in the fabric stretched on the core.

x-Q. 42. I mean, do you understand the tread roll is described in the patent in suit as having that function?

10 A. In this connection the specification says: "It will thus be clear that after the operator has drawn a layer of rubber coated canvas onto the ring core, he can, by pressing the tread forming roll 141 against the fabric, smooth and shape the fabric on the core and get it free of captured air bubbles or wrinkles over its outer face." (page 5, lines 82 to 88.)

Accordingly, the specification does describe the function of the tread roll to remove any wrinkles which may occur.

20 x-Q. 43. If a wrinkle should occur in the fabric that had been stuck on the tread portion of the core by the stretching operation, would the tread roller be able to remove said wrinkle and smooth the fabric on the core?

A. I do not know.

x-Q. 44. Does the patent in suit state anywhere how much tension or how much stretch should be given to the fabric led from the supply roll to the core?

A. No.

30 x-Q. 45. What do you mean in your direct testimony by the tread portion of the core?

A. The peripheral portion.

x-Q. 46. How much of the peripheral portion in a lateral direction?

A. Whatever portion is covered by the fabric when it is stretched on the core and revolving at low speed.

x-Q. 47. Then the definition of that expression used by you may not always be the same. Is that correct?

40 A. Yes.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 48. Does it always mean that part of the periphery of the core which lies outside, in a radial direction, the median line referred to by you and shown in your diagram entitled "Fabric Shaped to Core"?

A. Yes.

x-Q. 49. And the distance of the median line from the axis of the core, in a radial direction, would depend upon the amount of stretch given to the fabric while being applied to the core at slow rotation. 10

A. Yes.

[RECESS.]

x-Q. 50. Is it a fact that the patent in suit shows and describes that, as a result of the tension or stretch on the fabric during the slow rotation of the core, the fabric is applied to a part of the periphery of the core which is less in width than the length of the adjacent face of the tread roll? 20

A. I do not note that the specification says anything about this. Fig. 12^a shows the tread roll of greater length than the portion of the fabric which is in contact with the core, and on this showing I answer the question in the affirmative.

x-Q. 51. The specification of the patent indicates that Fig. 12 shows the fabric after it has been first applied to the core and before the tread roll 141 has acted upon it. Is that a fact? 30

A. No, I think this shows the beginning of the operation, when the leading edge of the fabric is first applied to the core and before any rotation begins at all.

x-Q. 52. Do you understand that the extreme periphery of the core is coated with an adhesive cement before the fabric is attached thereto at the beginning of the operation?

A. Yes, the specification says at page 3, line 55, that 40

Arthur S. Browne for Plaintiff—Cross.

in order that the ring core "may take hold of the fabric, the core is coated with rubber or cement".

x-Q. 53. Do you understand that it is practical to coat the extreme periphery of the core, or to coat the whole outside of the core upon which the fabric is to lie, with cement in making the tire?

A. It is quite unnecessary to coat the entire core. It is enough that there be sufficient adhesion between the leading end of the fabric and the core, so that the fabric will adhere to the core without slipping at the beginning of the operation. If the rubber compound in the fabric is sufficiently adhesive, no additional application of adhesive to the core is necessary.

x-Q. 54. Do you understand that it is the practice to apply an adhesive to the outer periphery of the core in this operation?

20 A. Yes, occasionally.

x-Q. 55. What is your understanding of the regular practice?

A. My observation in the Goodyear plant is that in most instances the condition of the fabric is such that no additional adhesive is required. In some instances apparently depending upon the judgment of the workman and the condition of the fabric, he places a narrow strip of soft rubber on the core, using it as an adhesive to cement to the core the leading end of the fabric.

0 x-Q. 56. Where does he place this strip of rubber, on the outer periphery, or on the side of the core?

A. On the outer periphery and extending partly down the sides of the core.

x-Q. 57. In your judgment, if the fabric were only applied to as much of the core as it is shown to be in contact with, in Fig. 12 of the patent, would there be sufficient adhesion between the fabric and the core to withstand the strain of the tension on the fabric?

40 A. There would not.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 58. Look at Fig. 12^c of the patent drawings, if you please, and tell me whether or not the rolls 147 could stitch the fabric into the creases of the core? I mean all the way in.

A. That would depend upon whether the lever arm 144 would be stopped by contact with the fabric before the rolls had pressed the margins of the fabric all the way in. I think as the draftsman has here shown, the movement of the arm 144 would be stopped before the rolls pressed the margin of the fabric all the way in. 10

x-Q. 59. If the fabric were applied to the core as indicated in Fig. 12^a, and then the roller 141 removed from contact with the fabric, with the core rotating at a speed of about 207 r.p.m., what do you think would happen with respect to the fabric remaining in adhesion with the core?

A. I think it would still remain in adhesion to the core. 20

x-Q. 60. Do you think that adhesion would be throughout the width shown in Fig. 12^a?

A. Yes.

x-Q. 61. Then how, according to the patent, would the margins of the fabric be applied to the core?

A. By the gradual advance and inward pressure of the forming rolls 147.

x-Q. 62^a. Do you believe that those rolls could smoothly form the fabric down? 30

A. Yes.

x-Q. 62^b. Would that operation of the rolls 147 be such an operation as you have mentioned in your direct examination as being a characteristic of the operation of the machine of the patent in suit?

A. Yes.

x-Q. 62^c. In that operation you would have a radial stretch exerted on the fabric at a point outside of, in a 40

Arthur S. Browne for Plaintiff—Cross.

radial direction, the point of extreme width of the core?

A. Yes.

x-Q. 63a. I want to call your attention once more to the mechanism for imparting high and low speed to the core. By the word "pitch", when we were speaking of the worms 76 and 82, did you intend to mean the distance traveled in a direction parallel with the axis of the worm by one complete turn of the worm thread?

10 A. Yes.

x-Q. 63b. That is how the word "pitch" is generally understood, is it not?

A. Yes.

x-Q. 63c. Will you look at Fig. 4 of the patent and say whether I am correct in stating that the pitch of the worm 76 on the scale of that figure of the drawing is about $1/12$ of an inch?

A. I should think that is an approximately correct
20 estimate.

x-Q. 64a. Then a worm having a pitch fifty times that of the worm 76 would have a pitch of about $4-1/6$ inches on the scale of Fig. 4. Is that correct?

A. It is a question of angle rather than of the actual dimension in inches which is important. The pitch of the worm 76 is such that at each revolution of the shaft 58 the spiral gear 75 is advanced one tooth. By increasing the angle of the teeth on the drive worm 76, a greater angular movement will be given to the driven spiral gear 75. And by changing this angle of the teeth
30 on the driving worm with corresponding changes in the shape of the teeth on the driven spiral gear, the spiral gear would be driven more and more rapidly.

x-Q. 64b. Can't you answer my last question yes or no?

A. I answer it—no.

x-Q. 64c. When you refer to increasing the angle of the worm 76, do you mean bringing the angle of the thread of the worm more nearly parallel to the axis of the worm?

40 A. Yes.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 65. In a worm having fifty times the pitch of the worm 76 in Fig. 4, would not one complete turn of the thread advance a distance of about $4\frac{1}{6}$ inches in a direction parallel to the axis of the worm; I mean on the scale of Fig. 4?

A. I do not know. I would have to stop and investigate that.

x-Q. 66. Are you willing to make a drawing or sketch on the scale of Fig. 4 of the patent in suit showing a worm having a pitch fifty times that of the worm 76? 10

A. I would first have to test it out by trying it on some actual gears.

x-Q. 67. You are unable to lay out such a worm substantially accurately?

A. Yes.

x-Q. 68. You have remarked that if the angle of the thread on the worm 76 were increased, the angle of the teeth on its mating gear 75 would also have to be changed.

A. Yes, it would, if the gears are to work smoothly. 20

x-Q. 69. If a high speed worm having a pitch 50 times that of the worm 76 were placed on the shaft 78, (as you suggested this morning), then the teeth on the gear 83 would be at a very different angle from the teeth on the gear 75. Is that right?

A. Yes.

x-Q. 70. And in such case, in the sectional view (Fig. 3) more than one tooth should appear in whole or in part on the gear 83. Is that correct? 30

A. Yes, if the draftsman had attempted anything more than a conventional illustration, and drawn his cross-section accurately. He should have shown probably several teeth in the cross-section of the gear 83. My experience with draftsmen is that they cannot be relied upon to show details of the gearing otherwise than conventional.

Mr. Seward: I move to strike out the last sentence of the answer as volunteered.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 71. Don't you think that the fact that the pitch of only one of the worms 76 and 82 is shown in the patent drawings, is an indication to a reader of the patent that the said two worms are alike?

A. No. The reader of the patent is advised of the substantial difference in speed obtained by the two worms 76 and 82, and that the gear 83 rotates much faster than
10 the gear 75. If the two worms were identical, then the only difference in speed would be that due to the difference in diameter of the two sprocket wheels on the two shafts 58 and 78, and hence the gear 83, instead of rotating faster than the gear 75, would rotate about 50% slower. Accordingly, a reader of the patent must assume that there is a sufficient difference between the worms 76 and 82 and the spiral gears rotated by them to produce the desired difference in speed.

20 x-Q. 72. And even such a skilled man as yourself is unable, without practical experimenting, to lay out the necessary worm. Is that correct?

A. Yes, I should have to go about it with care.

x-Q. 73. In the machines of the patent in suit which you have seen in operation, is it not a fact that the gear corresponding to the gear 75 in the patent drawings was
the high speed gear?

A. I did not observe the machines in this respect.

30 x-Q. 74. Do you understand it to be a characteristic of the patent in suit that the rollers with which the fabric travels in contact on its way to the core from the stock roller should have faces parallel to their axes as distinguished from convex faces?

A. That is what is shown in the patent.

x-Q. 75. Will you state whether or not you understand that to be a characteristic of the apparatus of the patent in suit as you have mentioned other things, in your direct testimony, to be characteristic of the patent in
40 suit?

Arthur S. Browne for Plaintiff—Cross.

A. I do not think that any details of the fabric supply of the patent in suit are characteristic beyond furnishing tension upon the fabric as it is drawn onto the slowly rotating core.

x-Q. 76. By the fabric supply, you mean the stock rolls and the tension rolls and connected parts?

A. Yes.

x-Q. 77. Do you understand that the centrifugal force 10 which you have referred to in your direct examination as resulting from the high rotative speed of the core and as having an effect upon the unattached fabric, has any co-operative effect with the tread roller 141 of the machine of the patent in suit?

A. No.

x-Q. 78. You have referred to the spinning rolls 147 as being pressed inwardly by springs or by weights. If the said rolls are pressed inwardly by springs is it a 20 fact that the pressure exerted by the said springs, and hence by the rolls, upon the fabric, becomes less as the said rolls progress from the point of extreme width of the core toward the inner periphery of the core?

A. Yes.

x-Q. 79. Is it a fact that if this pressure is exerted by weights, the said pressure upon the rolls, and hence of the rolls upon the fabric, would remain substantially constant during the travel of the rolls mentioned in the last question? 30

A. Yes.

x-Q. 80. Is it a fact that the displacement of the cords of the fabric increases from the point which you have referred to as the median zone (shown in your diagram "Fabric Shaped to Core") toward the inner margins of the fabric?

A. Yes.

x-Q. 81. Is it a fact that the centrifugal force, which you have stated in your direct examination, acts upon the 40

Arthur S. Browne for Plaintiff—Cross.

unattached fabric, becomes less and less as the fabric is attached to more and more of the core in inward radial direction?

A. Yes.

x-Q. 82. If the spinning rollers 147 are pressed inwardly by springs, they would exert a different pressure on the fabric on cores of different widths. Is that a fact?

10 A. Yes.

x-Q. 83. And if weights were used for this purpose, the pressure exerted by the spinning rolls on the fabric would be substantially the same on cores of different widths?

A. Yes.

x-Q. 84. What rotative speed of the core is necessary to produce the centrifugal force having the effect upon the fabric which you state in your direct examination? I mean in the machine of the patent in suit.

20 A. I have made some tests with the view of determining this, but have not yet reached a definite conclusion. But so far as I have gone, I should say that with a core on which a 34 x 4 inch tire was made there must be a speed of rotation of somewhere in the neighborhood of 50 r.p.m. to make the skirts of the fabric fly outwardly to any appreciable extent.

x-Q. 85. Did you try any experiments with larger cores than 34 x 4?

30 A. No, I did not try larger cores. Of course, the larger the core the greater the centrifugal force in a given number of revolutions per minute.

x-Q. 86. Do you maintain that in the machine of the patent in suit, when the core is rotated at high speed, there is an actual tendency on the unapplied parts of the fabric to move away from the axis of the core and that this tendency acts against the inward radial movement of the spinning rolls 147?

A. Yes.

40 x-Q. 87. Do you maintain that in the said machine the

Arthur S. Browne for Plaintiff—Cross.

spinning rolls bear upon, with their edges, a portion of the fabric which is unapplied to the core and flying out from the core, for instance, as shown in Figs. 12^b and 12^c of the patent drawings? I mean during the inward radial movement of the spinning rolls.

A. These figures only show approximately the action. My observation is that the rolls press the fabric against the core at the points where they make contact with the 10 fabric and the skirts fly outwardly from the attached portions of the fabric around the rounded edges of the spinning rolls.

x-Q. 88. Then you agree that, in this spinning operation, the operating edges of the spinning rolls press the fabric against the core instead of acting upon a part of the fabric which is not at that time in contact with the core. Is that correct?

A. They really do both. That is to say, at one portion 20 of its rounded edge the roll is pressing the fabric against the core and at another portion the spinning roll is bearing upon a part of the skirt which is extending outwardly away from the core.

x-Q. 89. You mean that one portion of the operating edge of the roll is acting upon the fabric against the core and another portion of the said edge of the roll is operating upon the fabric which stands away from the core.

A. Yes.

x-Q. 90. If the core is rotated at slow speed, say 6 to 12 r.p.m., during the inward radial movement of the spinning rolls, do you say there is any difference in the operation performed by the spinning rolls; I mean any difference between an operation under such circumstances and an operation where the core is rotating at high speed so as to throw the fabric out from its sides, as you have described.

A. Yes.

x-Q. 91. What is the difference?

Arthur S. Browne for Plaintiff—Cross.

A. In the first place, at the high speed the spinning roll is obliged to force the fabric down against the core against the outward pull on the fabric, due to the centrifugal force, and this action is not present when the core is rotating at slow speed.

In the second place, when the core is rotating at high speed, the centrifugal force tends to keep the skirts of the fabric smooth and minimizes its attempt to wrinkle or pucker, so that the fabric is laid smoothly upon the core.

10 On the contrary, when the core is rotating slowly, the skirts of the fabric are gathered in wrinkles or puckers and there is danger of these wrinkles appearing in the fabric when laid on the core.

March 27, 1919.

Met pursuant to adjournment.

Cross-examination continued.

20 x-Q. 92. Would the result insofar as the laying of the fabric down on the core and the arrangement of the threads of the fabric is concerned, be the same in either case, (referred to in x-Q. 90)?

A. I do not feel that I am at present qualified to answer this question. I have not investigated the effects of attempting to form the fabric with the core rotating at slow speed sufficiently to enable me to express a definite opinion with regard thereto.

30 x-Q. 93. In the disclaimer to the patent in suit reference is made to the ring core being rotatable at a fast speed "whereby the unapplied fabric portion is thrown out from the side of the ring core by centrifugal force". What is your understanding as to the angle at which it is meant the unapplied fabric portion is thrown out by centrifugal force, I mean the angle with respect to the plane of the ring core?

40 Mr. Rogers objects to the question in so far as it may be construed as calling for an interpretation

Arthur S. Browne for Plaintiff—Cross.

or construction of any of the claims in suit, being noted that the language quoted from the disclaimer refers directly to elements of the claims.

Mr. Seward. I refer the Court to Qs. 3 and 4 of the direct with their answers.

A. I do not understand that any particular angle is meant. The angle would depend upon the speed of rotation, the diameter of the core, and will vary in laying 10 down each layer of fabric as the forming or spinning rolls advance inwardly.

Take, for example, the case of the Goodyear machines as commercially operated, the skirts of the fabric are held out stiffly and smoothly and when the action of the spinning rolls begins, the condition of the fabric skirts is approximately that shown in Fig. 12^b of the State patent. As thus held out, the skirts of the fabric are smooth, they extend outwardly, in contact with the curved 20 edge of the spinning rolls, and as the core rotates it brings successive portions of each outlying skirt into contact with a portion of the corresponding spinning roll in advance of the part of the spinning roll which presses the fabric against the core. Accordingly, as the core rotates, the fabric skirt, as it reaches each spinning roll, is folded down against the roll and in opposition to the strain on the skirts of the fabric due to centrifugal force.

The actual angle between the fabric skirts and the plane of the core rotation varies as the spinning rolls 80 move radially inward, but, if the speed of rotation is adequate, the conditions just stated will continue until the work is finished.

x-Q. 94. Will you answer the last question leaving out of consideration the presence or action of the spinning rolls.

A. If the spinning rolls are not used, the condition of the skirts will remain as they are when the high speed is first attained after the fabric has been stretched on the 40

Arthur S. Browne for Plaintiff—Cross.

core. With the speed of rotation used on the commercial Goodyear machines, the skirts of the fabric will then stand out substantially at right angles to the plane of rotation of the core and in a smooth condition.

10 Mr. Rogers objects to the question as not directed to subject matter comprised within witness's direct testimony and as purely hypothetical, as it involves a mode of operation not contemplated in the commercial operation of the machine.

x-Q. 95. Then is it your understanding of the language I have quoted from the disclaimer that the unapplied fabric is thrown out to a position substantially at right angles to the plane of the core by centrifugal force?

20 A. I think this would be the case if the centrifugal force was being used to the best advantage. My observation is that the skirts are thrown out at substantially right angles to the plane of the core when a 34 x 4 core is rotating at about 80 r.p.m., but at that speed the skirts are not smooth, but still present waves or corrugations. These waves or corrugations disappear, however, at a higher speed, such as that employed in the Goodyear commercial machines and the centrifugal force is then utilized to good advantage.

x-Q. 96. You mean the thrown-out portions of the fabric will be smooth at a speed of about 120 to 150 r.p.m. Is that correct?

30 A. They are smooth at that speed and become so somewhere between 80 r.p.m. and 120 r.p.m.

x-Q. 97. You do not know any more accurately than you have just stated at what speed the outlying portions of the fabric become smooth. Is that correct?

A. Yes.

x-Q. 98. Does the cross sectional dimension of the core affect the angle at which the fabric is thrown out for any given speed of rotation?

40 A. No.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 99. At what angle must the unapplied fabric be thrown out by the rotation of the core before it usefully co-operates with the inwardly moving spinning rolls, as you have described? I mean at what angle to the plane of the core.

A. I have not investigated the limitations sufficiently to give a categorical answer to this question. Of course, in a machine where high speed, for example, is a factor, ¹⁰ there will be a point at which the benefits of the high speed will begin to disappear. There will be another point in slowing down the speed where none of the advantages of high speed are present. Between these two points there is a range of speed which may be looked upon as a doubtful zone, during which the advantages of the increased speed will more and more show themselves. But to determine at just what speed any particular phenomenon begins to be appreciable, requires a special investigation as to that particular phenomenon before any ²⁰ definite conclusion is reached.

Now, I have not made any such elaborate tests as would enable me to determine the critical points of speed or angle with respect to the various phenomena which counsel may inquire about.

Accordingly, I am not able to give the angle inquired about because I have not investigated it.

x-Q. 100. Can you state it approximately?

A. No, I have made no tests which enable me to state ³⁰ the angle even approximately.

x-Q. 101. Can you state it within 45°?

A. No, I am not going to make any guesses with respect to any specific degree. Such a matter is susceptible of investigation and a determination of the limits. Not being able to foresee all the inquiries which counsel might make, I have not conducted tests which enable me to answer such inquiries.

x-Q. 102. I understand from your last answer that ⁴⁰

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you do not know within a total range of 45° , at what angle of the thrown-out fabric to the plane of the core the said thrown-out fabric, under the influence of centrifugal force, usefully co-operates with the inwardly moving spinning rolls. Is that correct?

A. Yes.

10 x-Q. 103. Do you say that the patent in suit shows means for driving the shaft 90, which carries the core, at a speed of 6 r.p.m.

A. As the specification gives as an example 6 r.p.m. for slow speed at two places (p. 2, line 2, and page 6, line 109) I assume that the shaft 58 is to be driven at such a speed that with the gearing ratio shown in Fig. 4 the shaft 70 will be driven fast enough so that the gears 88 and 89 between it and the shaft 90, which are shown in Fig. 5, will drive the core at the speed of 6 r.p.m.

20 x-Q. 104. A worm and gear mechanism is always used for the purpose of gearing down or slowing down the drive instead of for gearing up, isn't it?

A. No. I am familiar with several very interesting examples which serve for doing just the opposite.

x-Q. 105. Do you mean to say that the gear driven by the worm can be rotated by the worm at a higher speed than the speed of rotation of the worm?

A. Of course, both the gears are worms. If the worm of smaller diameter is the driving worm, the worm
30 of larger diameter might be driven either at the same r.p.m. or even more rapidly to some extent. If the worm gears be used for greatly multiplying the speed, the driven worm would be of smaller diameter than the drive worm.

x-Q. 106. Referring to the patent drawings, would you say that the part 76 and the part 75 are both worms?

A. Yes, they both have spiral teeth.

40 x-Q. 107. You consider it mechanically correct in the case of a worm and gear drive to refer to either part

Arthur S. Browne for Plaintiff—Cross.

as the worm and the other part as the gear, is that correct?

A. Yes, if any generic expression is to be used to cover all instances.

x-Q. 108. I mean, is that correct in the ordinary mechanical parlance?

A. Of course, ordinarily the worm gearing is employed for speed reduction, so that ordinary usage would be such as used in the State patent, which calls the part 76 the worm and the part 75 a spiral gear. But the distinction between the two disappears when the organization is such that one drives the other at an equal or nearly equal speed. In such a case either gear could be called a worm.

x-Q. 109. In the arrangement to which you last referred would the axes of the two gears be at right angles to each other?

20

A. Yes.

x-Q. 110. Could the gear 75 in the patent drawings drive the worm 76?

A. No.

x-Q. 111. Do you say a worm could be substituted for the worm 76 which would drive a gear of the diameter of the gear 75 at a higher rotative speed than that of the worm?

A. I think so.

x-Q. 112. Isn't there a mechanical limit to the ratio³⁰ of rotative speed of the driving worm and its driven gear?

A. Yes.

x-Q. 113. What is it?

A. I do not know.

x-Q. 114. Do you say that the driving worm can rotate its driven gear at a rotative speed as great as that of the driving worm?

A. Yes.

x-Q. 115. In so far as the action of the spinning rolls⁴⁰

Arthur S. Browne for Plaintiff—Cross.

147 of the machine of the patent in suit is concerned, which action you have described, does it make any difference whether the fabric is stretched on the core by the machine or by hand?

A. So far as the mechanical action of the spinning rolls is concerned, it would have no effect. The product might be materially affected.

10 x-Q. 116. Do you understand the expression "sheet fabric" in the patent to mean only a woven fabric having warp and weft threads?

A. Yes.

x-Q. 117. How do you know that, in the operation of the defendant's machine which you witnessed on March 18, 1919, the fabric was laid down by the radially moving forming rolls, so that the reticulations of the fabric threads were shaped and disposed as you have described
20 in your direct-examination?

A. I so infer because the effect of the defendant's machine was to lay the fabric smoothly on the core, and because the organization and mode of operation so far as the rapidly rotating ring core and the radially advancing spinning rolls were substantially the same as in the Goodyear commercial machine. I assume therefore the similarity in instrumentalities and in the appearance of the product was due to similar action upon the fabric.

30 x-Q. 118. In the machine of the patent in suit, the spinning rolls are at a receding angle to the plane of the core throughout their operation. Is that a fact?

A. Yes.

x-Q. 119. Is that true with respect to defendant's machine?

A. As I recall, the exhibition of March 18, 1919 of defendant's machine, the action of the spinning rolls began with them occupying a receding angle to the plane
40 of the core about as indicated in Fig. 14 of the patent

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on defendant's machine, namely, the Thropp and DeLaski patent No. 1,119,326. This angle was maintained until the forming or spinning rolls reached the maximum width of the core and began to move inwardly along the decreasing diameter of the core. When this position was reached, the workman moved the plates corresponding to plates 122 of said patent so as to bring the plane of the spinning rolls about perpendicular to the plane of the core rotation, and this condition was maintained during the remainder of the laying down of the skirts of the fabric against the core. 10

x-Q. 120. Referring to the machine of the patent in suit, do you say that the spinning rolls 147 will form down the unapplied skirts of the fabric, during high speed rotation of the core, as you have described, if the spinning rolls are pressed laterally against the core only by the springs unassisted by any force exerted by the operator? 20

A. Yes.

x-Q. 121. Do you say it will form the fabric down substantially wrinkle free and in a practical condition?

A. Yes.

x-Q. 122. Would this occur if the core were rotated at 207 r.p.m.?

A. I think so.

x-Q. 123. Have you ever noticed what the forming rollers do when they pass over the splices whereby the ends of the fabric strips are joined, if they are not pressed inwardly by the operator's strength? 30

A. Yes, they ride over the joints.

x-Q. 124. Do they jump away from the fabric on the core?

A. I have never observed any such jumping away from the fabric.

x-Q. 125. Did you ever carefully observe to see whether they do jump away or not? 40

Arthur S. Browne for Plaintiff—Cross.

A. I have watched them in action and if there has been any jump beyond the slight outward movement due to riding over a double thickness of material, it has been so inappreciable that it has not attracted my attention.

x-Q. 126. Did you ever see the machine of the patent in suit operated, in which operation the spinning rolls were fed radially and shaped on the fabric as you have
10 described, and at which time the operator did not exert some force on the spinning rolls or their support to press them laterally toward the core?

A. On the contrary, I have never seen in any of the Goodyear machines any pressure at all applied at any time by the hands of the operator in pressing the spinning rolls toward the core.

x-Q. 127. You mean pressure applied by the operator directly or indirectly?

20 A. Either directly or indirectly.

x-Q. 128. Did you ever see a machine exactly like the drawings of the patent in suit?

A. As I have heretofore stated, the commercial Goodyear machines were not identical with the machine shown in the patent in suit. I did not examine the machine at Cincinnati thoroughly as to its mechanical details, and accordingly cannot say how closely that machine follows the detailed mechanical construction shown in the State patent drawings.

30 As the question refers only to what is shown in the drawings, I would not expect any machine to be identical with the drawings in one identical place, since the specification says that the springs 145 are "shown, diagrammatically, as leaf springs" (page 5, line 111), but states that in practice "strong spiral springs will be used".

x-Q. 129. Now will you say whether you ever saw a machine exactly like the drawings of the patent in suit?

40 A. I am not able to say whether or not the machine

Arthur S. Browne for Plaintiff—Cross.

at Cincinnati is or is not identical with that shown in the drawings of the patent in suit, because I did not scrutinize it closely enough.

x-Q. 130. The other machines which you saw differed from the machine shown in the patent drawings in other respects than with reference to the springs for forcing the spinning rolls laterally, didn't they?

A. Yes.

10

[RECESS.]

x-Q. 131. I call your attention to x-Q. 111. Would your answer be the same if you should limit the worm to a diameter of only about $\frac{1}{2}$ of that of its driven gear, as shown in Fig. 4 of the drawings?

A. Yes.

x-Q. 132. In such case how many teeth would there be on the driven gear and how many threads on the driving worm? 20

A. In the stated case of the worm 76 being $\frac{1}{2}$ the diameter of the driven gear 75, and assuming that the gear 75 is to be driven so as to make one rotation to one rotation of the worm 76, and as I recall the conditions of such gears, the teeth on the worm 76 would be at an angle of 30° to the axis and those on the driven gear would be 60° to its axis. The number of teeth would be greater or less depending upon the width of each spiral rib. It is customary in spiral gears to have several widths of teeth on one gear in mesh with several teeth on the driven gear. Accordingly the number of teeth altogether would depend on their fineness. 30

x-Q. 133. Have the number of teeth anything to do with the ratio of relative speed between the worm and its driven gear?

A. It would not have anything to do with the relative speed, but it might be very material in keeping the two gears in continual mesh with each other. 40

Arthur S. Browne for Plaintiff—Cross.

x-Q. 134. Now I ask you, in the construction you have just described how many teeth there would be or how many threads there would be on the driving worm.

A. That would depend upon the fineness of the teeth. As a rough calculation I should say there would be 25 teeth on the worm 76, assuming the teeth to be of the same width as those shown on Fig. 4.

10 x-Q. 135. How many on the driven gear 75?

A. About twice that number.

x-Q. 136. Will you make a sketch of that arrangement of worm and gear?

A. I will have one made under my direction.

x-Q. 137. Will you try to bring that tomorrow morning?

A. Yes.

20 x-Q. 138. Do you say that the machine shown in the patent in suit has the spinning rolls mounted mechanically so as to ensure their radial movement with a gradual advance in proper relation to the fast rotating core?

A. Yes.

x-Q. 139. Does the rotation of the core, in the patent in suit, affect in any way the radial feed of the spinning rolls?

A. No, the radial movement of the spinning rolls is done by the workman turning the feed screw by hand.

30 x-Q. 140. No matter what the rotative speed of the core may be, the spinning rolls may be fed inwardly by the workman either slowly or rapidly. Is that correct?

A. Yes.

x-Q. 141. The workman could feed them inwardly, during any rotative speed of the core, with a rapid inward motion part of the time and a slow inward motion the rest of the time, couldn't he?

A. Yes.

40 x-Q. 142. The mechanism which rotates the core has

Arthur S. Browne for Plaintiff—Cross.

no effect whatever upon the radial movement of the spinning rolls, in the machine of the patent in suit. Is that correct?

A. Yes.

x-Q. 143. Then what is the means which ensures that the radial movement of the spinning rolls shall be gradual and in proper relation to the fast rotating ring core?

A. The carriage on which the spinning rolls are supported slides upon a guideway, and this guideway is so disposed with respect to the plane of rotation of the core as to ensure that the spinning roll carriage will move radially with respect to the core. The carriage is fed in this radial direction by a feed screw, so that the gradual advance of the carriage is ensured. This gradual advance may not be uniform, since it is dependent upon the hand of the workman, but he soon acquires the necessary skill to enable him to feed uniformly the carriage, and at a speed proper for the rotation of the core. 10

x-Q. 144. But you agree that there is no means in the machine for ensuring that the spinning rolls shall progress inwardly at any given speed with respect to any rotative speed of the core. That is a fact, isn't it?

A. Yes.

x-Q. 145. It is important, if the machine is to operate practically, that the rolls shall be fed inwardly at a speed having some relation to the rotative speed of the core, is it not? 20

A. Yes, within limits.

x-Q. 146. If the workman turns the hand wheel on the feed screw too rapidly, the spinning rolls will not lay the fabric down smoothly. Is that a fact?

A. Yes.

x-Q. 147. What do you mean by the "hinge" of the fabric skirts thrown out from the core?

A. The line on which the fabric turns in swinging out. 40

Arthur S. Browne for Plaintiff—Cross.

This line is where the free skirt adjoins the attached portion of the fabric.

x-Q. 148. That is, it is the line at which the fabric ceases to adhere to the core. Is that a fact?

A. Yes.

x-Q. 149. Did you notice that the defendant's machine has means for rotating the core in two directions?

10 A. I notice that the patent on defendant's machine so describes the drive mechanism of the core, but I did not notice whether the machine itself is so equipped, but assumed it was.

x-Q. 150. Then you did not notice at the demonstration of March 18th, of defendant's machine, whether the core was rotated in one direction while taking the fabric from the supply and in another direction while the spinning rolls were in operation?

20 A. I did not notice.

x-Q. 151. Did you notice that defendant's machine has means for drawing the fabric onto the core while the core is rotating in either direction?

A. Yes, it was pointed out to me by one of defendant's representatives.

x-Q. 152. The machine of the patent in suit has not this arrangement, has it, or an arrangement for operating in this manner?

A. No.

30 x-Q. 153. Did you notice in defendant's machine that the fabric supply rolls and tension and guide rolls are mounted vertically above the core?

A. Yes.

x-Q. 154. And that they are adjustable vertically toward and from the core, so that the distance between the last roll engaged by the fabric and the point of application of the leading end of the fabric to the core may be made shorter than is permitted by the construction of the
40 machine of the patent in suit?

Arthur S. Browne for Plaintiff—Cross.

A. Yes.

x-Q. 155. Do you consider it a characteristic of the machine of the patent in suit that the inwardly moving spinning rolls shall operate on only a small area of the fabric during any single rotation of the core?

A. Yes.

x-Q. 156. How small?

A. So small that there will be no portion of the fabric 10 so far uncemented to the core as to permit the existence of trapped air.

x-Q. 157. Do you consider it a characteristic of the patent in suit that the circumferential path of the spinning rollers on the fabric shall take the form of a spiral?

A. Yes.

x-Q. 158. How close together must the spirals be?

A. So close that there won't be any trapping of air due to a portion of the fabric being uncemented to the 20 core.

x-Q. 159. Can you give the dimension of the distance between the spirals?

A. In the operation of the machines at the Goodyear factory my estimate is that the spirals are about $\frac{1}{8}$ of an inch apart.

x-Q. 160. And is that your understanding of the operation of the machine of the patent in suit?

A. Yes, though doubtless there is some latitude permissible. For example, I noted that in the defendant's 30 machine the spirals, as nearly as I could estimate, were about $\frac{1}{6}$ of an inch apart. They might be less than $\frac{1}{8}$ of an inch apart, but that would slow down the production.

x-Q. 161. Can you give any more accurate estimate of the distance which the spirals can be apart within the characteristic operation of the machine of the patent in suit?

A. I did have one of the workmen at the Goodyear 40

Arthur S. Browne for Plaintiff—Cross.

factory feed the carriage so fast that the spirals were approximately $\frac{3}{8}$ of an inch apart, and it was then evident that the intermediate portions of the fabric were not cemented to the core. I did not determine just what the maximum permissible distance might be.

x-Q. 162. Did you try $\frac{1}{4}$ of an inch?

10 A. No.

x-Q. 163. Do you consider it a characteristic of the machine of the patent in suit that the spinning rolls shall have a narrow operating edge?

A. The spinning rolls should have a rounded edge. I did not measure the thickness of the spinning rolls at the working edge, but I should estimate it at about $\frac{1}{6}$ of an inch. They should not be so narrow as to cut or fray the fabric, and should not be so wide as to prevent
20 their ability to press the fabric against the core where it has just been laid down. I could not give any quantitative limit in fractions of an inch.

x-Q. 164. You stated in the direct-examination "The machines which I have seen in use at the Goodyear Tire & Rubber Co.'s factory at Akron, Ohio, so far as relates to the fabric supply, the high and low speeds, the speed changing mechanism, the spinning rolls, and the gradually fed support or carriage for said rolls, are organized and constructed in all substantial respects like the machine illustrated in the State patent in suit, and act in
30 the same way". Do you mean that the tension and guide rolls of the machines in the Goodyear factory, that the gearing for producing the high and low speeds of the core, that the shape and size of the spinning rolls of the said machine, were like those shown in the drawings of the patent in suit?

A. There was a number of differences between the machines in use at the Goodyear factory and the machine
40 specifically illustrated in the patent in suit, and per-

Arthur S. Browne for Plaintiff—Cross.

haps it will be a saving of time if I schedule all that I noted, in addition to those specifically inquired about.

Some of the Goodyear machines are duplex machines having two ring cores, and some are single machines having only a single ring core.

The patent shows the machine equipped with four fabric supply rolls, which is true of some of the Goodyear machines, while other machines have six supply rolls. 10

So far as each supply roll and its tension, take-up and stretching rolls are concerned, I did not notice any difference as compared with the patent.

The Goodyear machines have high and low speed mechanism, and speed changing mechanism, but I did not examine the details of this mechanism so that I can state whether there are any specific differences within the same as compared with what is set forth in the patent, excepting, as I have already stated, that the speed ratio is not as great as that which the State patent gives as an example. I measured the spinning rolls used on the duplex machine, which were 4 inches in diameter, and hence somewhat larger in diameter than those shown in the patent. 20

The shape of these rolls is substantially that shown in the patent.

On some of the machines the spinning rolls are dish-shaped, and while I did not measure I should estimate them to be somewhat less than 4 inches in diameter. 30

Some of the machines are used in making clencher tires, and others are used for making tires in which the beads have wires embedded in them, such beads having straight sides. The machines which are used for making the tires with the straight side beads do not have any trimming cutters. The machines which make the clencher tires have trimming cutters which are not mounted on the turret which carries the rolls, but on separate frames.

Both styles of machines have tread rolls correspond- 40

Arthur S. Browne for Plaintiff—Cross.

ing in function with the tread rolls 141 of the patent, but they are not mounted on the turret. Each tread roll is on a separate frame which is under the control of the foot of the workman.

Also neither style of machine has the bead forming rolls shown at 156 and 158 and 159 of the State drawings.

Also each form of machine has a single lever for
 10 separating the spinning rolls and holding them apart.

In all the machines each spinning roll is pressed toward the core by a strong spiral spring, as described in the State patent at page 5, line 12; instead of the diagrammatic leaf spring shown in Fig. 9.

x-Q. 165. Did you notice whether or not the tension roll and the guide roll (which is referred to in the patent as a "stretching roll") were convex, as distinguished from cylindrical?

20 A. I did not. If there was any convexity it was so small that it escaped my observation.

x-Q. 166. In your direct testimony you said, on page 17, "The unattached skirt is forced outwardly by centrifugal force in opposition to the inward pressure of the forming or spinning-roll. The effect is as though the margins of the skirt were being pulled outwardly by invisible fingers against whose pull the spinning rolls must act in forcing the fabric at the hinges against the core." By the word "skirt" did you mean the unapplied margins
 30 of the fabric, and by the word "outwardly" did you mean outwardly in a radial direction with respect to the core?

A. I did mean the unattached portions of the fabric by "skirt".

By the fabric being forced outwardly I meant away from the core. The skirts of the fabric do not stand out radially.

x-Q. 167. In what direction, with respect to the core, did you mean to indicate that the force exemplified by
 40 "invisible fingers" was being exerted?

Arthur S. Browne for Plaintiff—Cross.

A. In a direction away from the core and which sometimes extends perpendicular to the plane of the core and sometimes at an angle to it.

x-Q. 168. When you say sometimes at an angle to the plane of the core I assume that you mean sometimes at less than an angle of 90° to the plane of the core?

A. Yes.

x-Q. 169. In such cases, is the force to which you refer 10 exerted in the direction toward the periphery of the core from a plane at right angles to the plane of the core, the first named plane being located at about the median zone to which you have referred?

A. The centrifugal force is always radially outward. The effect exhibited by the fabric is that sometimes the fabric stands at an acute angle away from the axis of rotation and sometimes at an angle toward the axis of rotation and sometimes substantially parallel with the 20 axis of rotation.

x-Q. 170. Do you mean that the force exerted by the "invisible fingers" is always radially outward or is in a direction parallel with the plane in which the outlying skirts of the fabric are lying?

A. Of course, the "invisible fingers" is a figurative expression, and has reference rather to the direction in which the skirts are standing out, than to the actual direction of the centrifugal force. 30

Adjourned.

MARCH 28, 1919.

Met pursuant to adjournment.

Cross-examination continued.

x-Q. 171. Do you mean by your last answer that the force which you have mentioned as being exerted, figura- 40

Arthur S. Browne for Plaintiff—Cross.

tively speaking, by "invisible fingers", is exerted in a direction away from the plane of the core and substantially parallel to the plane in which the outlying fabric skirts are at any given moment?

A. Yes. Of course, as I have said before, the centrifugal force which causes the skirts to stand outwardly away from the core is exerted in an outward radial direction. The appearance of the fabric at any moment is such
10 that it looks as though fingers were pulling upon the fabric in the angular direction which the skirts at the time being occupy.

x-Q. 172. Have you made the sketch referred to in x-Q. 136?

A. Yes, I had such a sketch made, and produce it.

This sketch includes three figures. The two upper figures are diagrams giving the outlines of the gears
20 corresponding to the gears 82 and 83 of the State patent, and in as nearly the proportions as the draftsman could get.

The third figure shows both gears in plan view, the gear 82 being shown over the gear 83. I have not had the draftsman attempt to show the spiral formation of the gear teeth, since this would have taken too much time. As shown in this figure, the teeth are shown straight instead of spiral, this being a usual convention in illustrating such gears. As shown in this figure, the
30 teeth on the driving gear 82 are at an angle of 30° to its axis of rotation. The teeth on the driven gear 83 are at an angle of 60° to its axis of rotation.

Such a gearing would be competent to rotate the core at the ratio of speed stated in the State patent.

x-Q. 173. In making this sketch did you consult any other mechanical expert?

A. Yes, I consulted Mr. Frederick Ray.

x-Q. 174. Are the teeth on the two gears intended to
40 be of the same width?

Arthur S. Browne for Plaintiff—Cross.

A. Yes, so that they will mesh with each other.

x-Q. 175. How many teeth are intended to be on the gear 82?

A. Twenty-two.

x-Q. 176. And how many on the gear 83?

A. Twenty-two.

x-Q. 177. In answer to x-Qs. 134 and 135 yesterday you stated that the driven gear would have about twice ¹⁰ the number of teeth on the driving gear.

A. Yes, I answered too hastily, overlooking for the moment the fact that the angle was twice as great in one instance as in the other.

x-Q. 178. In the arrangement shown on this sketch, what do you say will be the ratio of rotation of the gear 82 to the gear 83?

A. They will rotate at the same speed if the teeth are the same in number. It may be in this sketch which I have that the gear 83 will rotate faster than the gear 82 ²⁰ by reason of the circumstance that the gear 83 is not twice the diameter of 82. In that event the teeth on 83 would be fewer in number than those on 82.

In such case the speed of 83 would be slightly greater than that of 82 in r.p.m.

x-Q. 179. Would you have required actual experiment to lay out the teeth in proper spiral form?

A. I suppose a skilled draftsman would be able to make the proper spiral form without having a gear to ³⁰ follow, but, as I am not a skilled draftsman, I should have to have the actual thing to go by, in order to approximately show the correct spiral form.

x-Q. 180. Could you show it by a single line for each tooth without actual experiment?

A. Not with any accuracy.

x-Q. 181. Do you say that the gear 82 shown in this sketch is properly called a worm?

A. Yes.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 182. Is it proper to call a pair of gears "a worm and gear" when they have the same number of teeth?

A. Yes, and it is also proper to call them both worms or both spiral gears or both helical gears or to use one name for one gear and another name for another gear. However the terms may be used, there is no difficulty in understanding what is meant.

10 x-Q. 183. Is it customary among mechanical men to call such an arrangement a worm and gear?

A. I don't know what the percentage that use it one way or another may be. I think it is common usage.

x-Q. 184. On this sketch do the initials "P. D." refer to the pitch diameter?

A. Yes.

x-Q. 185. And the figures in front of the said letters represent the actual pitch diameters of the corresponding
20 gears on the scale of Fig. 4 of the patent drawings, in inches?

A. Yes.

Mr. Seward: I request my adversary to permit me to offer this sketch in evidence at this time.

No objection.

I offer this sketch in evidence, and request that it be marked "Defendant's Exhibit A, Browne's
30 Sketch of Gearing".

x-Q. 186. What is the speed ratio of the worm 76 to the gear 75 shown in Fig. 4 of the patent drawings?

A. 1 to 45. That is to say, the shaft 58 rotates 45 times as fast as the shaft 70.

x-Q. 187. I refer you to the last sentence of your answer to x-Q. 91. Were you referring to the machine of the patent in suit in that sentence?

A. Yes.

40 x-Q. 188. Do you consider the operation described in

Frederick Ray for Plaintiff—Direct.

that sentence to be a characteristic of the machine of the patent in suit?

A. Yes.

x-Q. 189. Referring again to the sketch "Defendant's Exhibit A", do you say that it would be practical to use such a gearing arrangement for transmitting a fairly heavy load in machinery, the understanding being, as before, that the gear 82 is the driving gear?

10

A. Yes.

x-Q. 190. Do you say that, in the sketch "Defendant's Exhibit A", the gear 82 would be operative to drive the gear 83, if the teeth were straight, as shown?

A. No.

Cross-examination closed.

Redirect-examination waived.

Signature waived.

20

Whereupon FREDERICK RAY, a witness called on behalf of plaintiff, being duly sworn, deposes and says in answer to interrogatories proposed by Mr. Rogers, as follows:

Q. 1. Please state your name, residence and occupation.

A. Frederick Ray, Short Hills, N. J., Mechanical Engineer and mechanical designer.

Q. 2. Have you designed machinery to any extent?

A. Yes, I have been engaged in designing machinery³⁰ during practically my whole professional life.

Q. 3. In that work has it ever been necessary for you to design gearing?

A. Yes, very frequently.

Q. 4. Were you present during the cross-examination of Mr. Browne?

A. I was.

Q. 5. Did you hear the extensive cross-examination relating to the particular form of gearing disclosed in the 40

Frederick Ray for Plaintiff—Direct.

State patent for the purpose of transmitting fast speed to the ring core?

A. I did.

Q. 6. Referring particularly to x-Qs. 66 and 67 on page 58, will you state whether or not you have been able to lay out the gearing therein referred to?

A. Yes, I have laid out such gearing.

10 Q. 7. Without going extensively into your calculations, will you state the general result of this laying out?

A. The calculation taking into consideration the speed ratio set forth in the patent results in the speed ratio of the pinion 82 to the gear 83 being almost identically unity. Taking into account the diameters of these two gears as approximately shown in the patent results in the gear drive shown on the sketch "Defendant's Exhibit A". The tooth angle of the pinion in this drive is 30° and of the gear is 60°. These tooth angles and the diameters given on this drawing give this speed ratio of approximately unity.

Q. 8. Is this particular angularity of tooth an unusual one?

A. No, on the contrary it is quite common.

Q. 9. In your experience have you encountered even more acute angularity than this?

A. Yes, I have.

30 Q. 10. In cases where the worm is the driven member as well as in cases where the worm is the driving member?

A. Yes.

Q. 11. Are you able to produce any specimen of greater angularity than the one referred to by you wherein the worm is the driven member?

A. Yes, I can and produce here the governor and governor shaft of a talking machine motor. On this governor shaft there is a worm having a double thread, and this thread, as near as I am able to measure it, makes
40 an angle with the axis of 68°. In the motor it is driven

Frederick Ray for Plaintiff—Cross.

by a gear the angle of the teeth on which is 22° . These governors drive very easily, without any difficulty whatever, in fact.

Q. 12. Recurring to the specific lay-out you have already referred to, wherein the respective angles are 60° and 30° , which member would be the driving member and which the driven member?

A. The gear marked 82 is the driving member and the 10 gear marked 83 is the driven member.

Q. 13. Is such an arrangement of gears capable of driving and sustaining a heavy load?

A. Yes, they will carry heavy loads if of proper size, that is, if the teeth are large enough and if they are designed properly for the load.

Direct-examination closed.

CROSS-EXAMINATION BY MR. SEWARD:

20

x-Q. 1. How long have you been practising as a mechanical engineer?

A. I have been engaged as a mechanical engineer and designer since about 1900, that is, since I left college.

x-Q. 2. And you obtained the degree of mechanical engineer about 1900?

A. No I never obtained a bachelor's or what you might call a lower degree. I have received a graduate degree, M. A., 1913 from Columbia University in physics and mathematics. 30

x-Q. 3. You have had a good deal of experience as a machine designer in a practical and theoretical way both.

A. Yes, most of my work was done in that line.

x-Q. 4. And have you had a great deal of experience in laying our gear drives, both practically and theoretically

A. Yes, I have had a good deal of experience in laying out gears.

40

Frederick Ray for Plaintiff—Cross.

x-Q. 5. And this includes worm and gear drives?

A. Yes.

x-Q. 6. Will you produce the lay-out of gearing referred to in Q. 6?

A. I referred to "Defendant's Exhibit A, Browne's Sketch of Gearing".

x-Q. 7. Would this arrangement of gearing shown on
10 the sketch operate if the teeth were straight as shown?

A. No, the teeth are shown in an ordinary manner to indicate that they are spiral gears. No attempt has been made to really show the shape of the teeth, which is very difficult to do.

x-Q. 8. Could you lay out the actual spiral shape of those teeth without actual experiment?

A. Yes.

x-Q. 9. Can you draw single lines on this sketch indi-
20 cating the spiral of a tooth on each gear?

A. I could do it, but it would require a great deal of work.

x-Q. 10. Is it common, in a worm and gear drive, to have the same number of teeth on the worm and on the gear, in a case in which the worm drives the gear?

A. Yes, that is quite common.

x-Q. 11. Is such an arrangement ordinarily referred to as a worm and gear?

A. Such gearing is more ordinarily called spiral or
30 helical gearing.

x-Q. 12. In the drawings of the patent in suit, the worm 82 is the driving member and the gear 83 the driven member. Is that correct?

A. Yes.

x-Q. 13. You stated that the governor shaft which you produced was driven by a gear having teeth set at an angle of 22°. How many teeth are there on that gear?

A. I do not know exactly. I did not have time to

Frederick Ray for Plaintiff—Cross.

obtain the whole of the outfit, but I understand there are about 30 teeth.

x-Q. 14. On the governor shaft you produced there are about five complete turns of the worm thread. Is that a fact?

A. No, it is a double thread, so there would be about two and one-half complete turns of each.

x-Q. 15. In a worm and gear drive, would the number of teeth have anything to do with the ratio of relative speed between the worm and its driven gear?

A. Yes, if you consider the number of teeth properly the speed ratio is directly in proportion to the number of teeth. For instance, the small governor shaft which I produced has upon it a spiral gear of two teeth, and the gear which drives it I stated to have approximately 30 teeth. The speed ratio is consequently approximately 15 to 1.

20

Cross-examination closed.

Deposition closed.

Mr. Rogers introduces in evidence the governor shaft referred to by the witness, marked "Plaintiff's Exhibit No. 6, Ray Governor Shaft".

Signature waived.

30

Mr. Rogers states that in this action he will ask for a decree only under claims 4, 5, 6, 7, 12, 13, 22, 23, 24, 25, 26, of the State patent in suit, as at present advised.

40

Walter S. Koplin for Defendant—Direct.

UNITED STATES DISTRICT COURT,

DISTRICT OF NEW JERSEY.

10	FRANK A. SEIBERLING, Plaintiff,	}	In Equity, No. 614.
	v.		
	THE JOHN E. THROPP'S SONS COMPANY, Defendant.		

Defendant's Testimony.

Testimony taken in behalf of the defendant, pursuant to notice and agreement of counsel, before CHARLES J. CAREY, Esq., a Notary Public within and for Summit County, in the State of Ohio; at the plant of The Firestone Tire & Rubber Company, Akron, Summit County, Ohio, beginning on Tuesday, April 29, 1919, at ten o'clock A. M.

APPEARANCES:

ROBERT FLETCHER ROGERS and LUTHER E. MORRISON, Esqs., for plaintiff; also CHAUNCEY L. LONDON, Esq., for plaintiff; and E. CLARKSON SEWARD, Esq., for the defendant.

WALTER S. KOPLIN, a witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. Walter S. Koplin; aged 46 years; Merriman Ave., Akron, Ohio.

Walter S. Koplin for Defendant—Direct.

Q. 2. Are you now employed by The Firestone Tire & Rubber Company?

A. Yes, sir.

Q. 3. What work do you do?

A. Repairing green tires.

Q. 4. Have you been an inspector here?

A. Yes.

Q. 5. Did you ever work for The Diamond Rubber Company? 10

A. Yes, sir.

Q. 6. About when did you start working there?

A. 1903.

Q. 7. What work did you do there?

A. Handbuilt tires for four years, and inspected for seven.

Q. 8. Just tell how you put the fabric on the core when you built tires there by hand.

A. We stretched fabric on by hand, and we made our splice; then we rolled it on top—O, about three inches, I should judge; and we were supposed to stitch it down, but when a man got used to it they would start the core to spinning as fast as it could and the fabric stuck out—why, we let it run that way until we got clear down to the bead. Then, of course, it would bring it down into the groove of the bead and then right over the edge.

Q. 9. After you started the core to spinning and the fabric stuck out, what kind of a tool, if any, did you use? 20 30

A. We used the ordinary hand-stitcher.

Q. 10. I hand you a tool, and ask you if that is anything like the hand-stitcher you referred to?

A. Yes, sir; only they wasn't ball-bearing that day. That's the only difference there was.

Mr. Seward: I offer this tool in evidence as Defendant's Exhibit B.

Q. 11. Now, with the core spinning, just explain how you used this hand-stitcher.

Walter S. Koplin for Defendant—Direct.

A. Why, just hold it up against the core this way, and it would naturally work down to the bead; and then, of course, it would run right around in the groove of the bead and over the edge.

Q. 12. When you said you were holding the stitcher "this way", were you holding it in both hands, near the right side of your chest?

10 A. Yes, sir.

Q. 13. Did this operation form the edges of the fabric down on the side of the core?

A. Yes, sir.

Q. 14. About how long had you been at the Diamond Company before you began to spin down the fabric in this way?

A. Perhaps a year or a year and a half.

Q. 15. About how often did you do it?

20 A. That would be hard to tell; a person building tires every day that way, you know, it would be hard to tell how many times a person would do it.

Q. 16. Do you mean that you did it every day?

A. Nearly every day, yes.

Q. 17. Did you see any other men there doing that same thing?

A. Yes, there was lots of them.

Q. 18. At this same period of time?

A. Yes, sir.

30 Q. 19. You spoke of rolling the fabric on top of the core?

A. Yes, sir.

Q. 20. What kind of a tool did you use for that?

A. It was a roller just like that, only just a trifle larger. Well, the one they use here is larger too.

Q. 21. Do you refer to roller that I have in my hand?

A. Yes. That isn't a regular tire-builder's roller. The kind they used down there is just exactly like that, only
40 a trifle longer.

Walter S. Koplin for Defendant—Cross.

Q. 22. Is the roller I show you now like the one you say you used in rolling down the fabric at the top?

A. Yes, sir.

Mr. Seward: I offer this last-named roller in evidence as Defendant's Exhibit C.

Direct-examination closed.

10

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 23. Is your memory good on dates?

A. Why, pretty fair. The reason I remember that date is because I had a recommend on that date. The one I got from Flynn had no dates on it.

x-Q. 24. How do you know that it was a year and a half after you went into the Diamond employment that you began to spin down tires by hand?

A. It was about that time. Why, a man has to have experience in the business quite a bit before he can do that. 20

x-Q. 25. You think, then, that it took you a year and a half of experience before you were able to run down tires by hand; is that what you mean?

A. Yes, so as to be a success, so they wouldn't wrinkle.

x-Q. 26. In other words, it required some skill and experience to prevent the fabric from wrinkling?

A. Yes. 30

x-Q. 27. When was it you became inspector at the Diamond plant?

A. It was about four years after I had been there.

x-Q. 28. That is, in the latter part of 1907?

A. Yes.

x-Q. 29. Did you ever run down tires by hand after you became inspector?

A. Not after I became inspector I didn't. The reason I didn't after I was inspector, I was breaking in new men 40

Walter S. Koplin for Defendant—Cross.

about half of the time; I was breaking in new men and inspecting both.

x-Q. 30. When you broke in new men, did you teach them to run down tires in the same way?

A. No.

x-Q. 31. Why not?

10 A. Because it was against the rules.

x-Q. 32. What were the rules that you followed in breaking in the new men?

A. Why, to stitch the plies down by hand.

x-Q. 33. When you say "to stitch the plies down by hand," do you mean that the ply was stitched down in a path something like as shown in this picture that I hand you?

20 A. Yes. Yes, a good deal in this form. Of course, you know, after we would break them in, they would naturally break away from the handbuilding, and, as I told you before, spin the tire.

x-Q. 34. You didn't think it was safe to let the new men do it until they had considerable experience?

A. Yes, it was not safe.

30 Mr. Rogers: Counsel for plaintiff introduces in evidence the sketch referred to in x-Q. 33, and it will be marked as Plaintiff's Exhibit No. 7. He further notes that, for purposes of convenience, he will hereafter refer to this method of hand stitching as the "saw-tooth" method.

x-Q. 35. Did you ever use this hand-spinning method continuously all day at the Diamond plant?

A. No, I couldn't do it only on small tires. The large tires the fabric was too stiff.

x-Q. 36. Did you practise the hand-spinning method all day on small tires?

40 A. No.

Walter S. Koplin for Defendant—Cross.

x-Q. 37. You did it only from time to time even on small tires?

A. Yes.

x-Q. 38. Can you tell me what was the weight of the fabric you used on the small tires?

A. No, I couldn't tell you that.

x-Q. 39. It was a lighter fabric, was it, than that you used on the larger tires? 10

A. O, yes!

x-Q. 40. Are you absolutely certain that you became inspector at the Diamond plant in the latter part of 1907?

A. Yes, sir.

x-Q. 41. Can you fix the date more accurately?

A. No, I don't believe I could. No, I couldn't remember that exact date.

x-Q. 42. Might it have been in 1908? 20

A. I wouldn't say for sure whether it was or not. It was about four years after I began there.

x-Q. 43. Might it have been in 1909?

A. It was before that.

x-Q. 44. Then the best of your recollection is, that you became inspector at the Diamond plant in 1907 or 1908?

A. Yes, sir.

x-Q. 45. When you spun down tires by the method you have described, were you sitting or standing? 30

A. Sitting.

x-Q. 46. Were the tires supported on ball-bearings?

A. No, sir.

x-Q. 47. When you held the stitcher in your two hands, in the manner described by you, did you lean your body up against the handle?

A. Yes, sir.

x-Q. 48. Was this the general practice?

A. Yes, sir. 40

Walter S. Koplin for Defendant—Cross.

x-Q. 49. Do you think you pressed the stitcher against the tire with as much force as the stitcher is now pressed against the tire, say, in machines like those in the Firestone plant here?

A. Why, I couldn't—it would be pretty hard for me to say that; I never worked on the machines; I never
10 worked on one of the building machines; I wouldn't know how hard they do bear down.

x-Q. 50. You have seen the weights on the Firestone machine, haven't you?

A. Yes, sir.

x-Q. 51. How much weight do you estimate is used in these Firestone machines for holding the stitcher or forming-roll against the tire on the core?

A. I should say there isn't any more than a man could use.

20 x-Q. 52. And how much is that?

A. Well, I don't know. Just what a person could bear his weight against there, and his strength too—bears right up against there—the tire.

x-Q. 53. You say, though, you were sitting down when you spun the tires by hand?

A. Yes, sir.

x-Q. 54. Could you apply your weight when you were sitting down?

30 A. Yes, sir.

x-Q. 55. Was not your weight supported by chair or stool you sat on?

A. No, a person would put their foot back and generally brace themselves.

x-Q. 56. Well, would you call that pressure given by weight or muscular pressure of the operator?

A. I don't know what you would call it.

40 x-Q. 57. Referring again to my x-Q. 51, are you able to estimate the amount of weight that is used in the Fire-

Charles R. Drach for Defendant—Direct.

stone machine for holding the stitcher or forming-roll against the tire on the core?

A. O, I should judge it would be about 30 or 40 lbs. I know a handmade tire is harder to repair as a green tire than a machine-made tire.

x-Q. 58. Why is a green or handmade tire harder to repair than a machine-made tire?

A. The plies are benzined just slightly before the 10 other ply is put on.

x-Q. 59. And that is what makes the fabric stick more tightly?

A. I think it is, yes.

Cross-examination closed.

Deposition closed.

Signature waived.

CHARLES R. DRACH, the next witness called on behalf 20 of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. Charles R. Drach; aged 37 years; Akron, Ohio.

Q. 2. You are working now for The Firestone Tire & Rubber Company?

A. Yes, sir.

Q. 3. What work are you doing now?

30

A. Why, I am doing everything in the Tire Room to be done, anything.

Q. 4. Did you ever work for The Diamond Rubber Company?

A. Yes, sir.

Q. 5. When did you first go there?

A. First went in 1905; I worked about three months; then I quit; went back in 1906 and worked about four years and eight months.

40

Charles R. Drach for Defendant—Direct.

Q. 6. When you went to the Diamond in 1906 what work did you do there?

A. Built tires by hand.

Q. 7. Please describe how you built the tires; I mean how you put the fabric on the core.

A. Well, we first cemented the core, and started the ply on top of the iron core, and pulled it around; then
10 we took and spun the core real fast, and held stitcher against it, right down to the bead line.

Q. 8. When you speak of a stitcher, was it a tool anything like Defendant's Exhibit B?

A. Yes, same thing, same thing; only the handle was straight; there was no bump in it.

Q. 9. When you spun the core real fast, what position were the edges of the fabric in?

A. Right out, right out straight.

20 Q. 10. Did you have any name you called that fabric standing out?

A. Why, when I first went there, they always told me saucer fashion, sticking right out.

Q. 11. How did you hold the stitcher when the tire was spinning?

A. I held it right on the side, and run it right down to the bead line.

Q. 12. Did you hold it in both hands?

A. Both hands.

30 Q. 13. Was it against your body, or away from your body?

A. It was away from my body.

Q. 14. How soon after you went to the Diamond Company in 1906 did you do this spinning down of the fabric?

A. Right away, when the rest of them was doing it, I started, right away.

Q. 15. Did you see other men there doing that same thing at the same time?

40 A. They all done it, the gang I was in, twelve men.

Charles R. Drach for Defendant—Cross.

Q. 16. When you say you held the stitcher on the side, do you mean on the side of the core?

A. On the side of the core.

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 17. When was it in 1906 you went back to the Diamond Company?

10

A. In June, about the second week in June. I don't remember the date.

x-Q. 18. And you say you began the hand-spinning method of making tires almost at once?

A. As soon as I started back to work in there they was all doing it.

x-Q. 19. Did your inspector or foreman tell you to make tires in this way, by the hand-spinning method?

A. He never told me which way, nor never stopped me from it. 20

x-Q. 20. Who was your inspector?

A. Why, George Whalen was one, and Arthur Harvey.

x-Q. 21. When you went to the Diamond Company, did they teach you any method of making tires by hand?

A. Never taught me to make tires.

x-Q. 22. You mean to say you just picked it up yourself?

A. Yes.

x-Q. 23. Was this hand-spinning method you have described the only method you employed in making tires in the Diamond plant? 30

A. Why, as far as I see, every gang does all the same.

x-Q. 24. You never saw any other method of making tires in the Diamond plant except by this hand-spinning method?

A. Never seen any.

x-Q. 25. In other words, that was the only method you ever saw in the Diamond plant, of making tires by hand? 40

Charles R. Drach for Defendant—Cross.

A. That's the only method I see.

x-Q. 26. And you used that method all day long, and never stitched down a ply of fabric on a core in any other way?

10 A. The last ply over the bead was spun down with the stitcher, and under the bead was stitched down; then we give it a spin, and held stitcher in there, and heaved it down to the bead line as far as it would go.

x-Q. 27. What did you do the first four months you came to the Diamond Company?

A. Build tires.

x-Q. 28. And how did you build them then?

A. Same way.

x-Q. 29. By the hand-spinning operation?

A. Hand-spinning operation.

20 x-Q. 30. Then you never built tires any other way all the time you worked for the Diamond Company?

A. I never built tires any other way, even during that first four months.

x-Q. 31. Then, so far as you know, the hand-spinning method was the only method ever employed by the Diamond Company in making tires by hand?

A. At that time.

x-Q. 32. At what time?

30 A. Well, about the time I was ready to leave the employment, they changed. The tires wasn't coming what they should be. They had a new system there then, changed the system; and I left for outside work.

x-Q. 33. What was the new system they introduced at that time?

A. Well, they claim that they formed air pockets.

x-Q. 34. You mean by the hand-spinning method?

A. By the stitcher pressing the stock made it more tight, more expand to it.

40 x-Q. 35. What do you mean by the stitching method?

Charles R. Drach for Defendant—Cross.

A. Well, it drew the stock to the core more by spinning it than it did by stitching it.

x-Q. 36. When was this?

A. Well, the second time when I was with the Diamond Company.

x-Q. 37. Had you ever seen this stitching method used in the making of tires?

A. On a new man, may be he couldn't spin the core 10 and stitch it down. Sometimes I have seen it.

x-Q. 38. Then, as a matter of fact, you were aware of another method being used for the making of tires by hand at the Diamond plant, other than by the hand-spinning method?

A. I was never told any other way. I was aware of such a method.

x-Q. 39. But you were taught to do it by the hand-spinning method; is that correct? 20

A. Correct.

x-Q. 40. Who taught you?

A. The inspector.

x-Q. 41. Please tell me the name of the inspector that taught you.

A. George Whalen.

x-Q. 42. And when was this?

A. 1906.

x-Q. 43. He taught you this in 1906?

A. Yes, sir. 30

x-Q. 44. How did you make tires during your previous employment by the Diamond Company, in 1905?

A. Well, made them the same way, only didn't make quite so many. I made them by spinning.

x-Q. 45. When was it you say the change occurred from stitching to spinning?

A. About two months before I left the Diamond Rubber Company the last time they wouldn't let them spin the tires. 40

Charles R. Drach for Defendant—Cross.

x-Q. 46. When was that?

A. In 1910.

x-Q. 47. And what was the difficulty that induced them to change from the hand-spinning method in that time, in 1910?

A. Well, the stock was narrow at times, and they couldn't form the bead line; had to be a bead line to put
10 the beads on; beads put on by hand.

x-Q. 48. They couldn't get the stock down to the bead line by the hand-spinning method?

A. They couldn't by stitching; by spinning we got it.

x-Q. 49. What method did they change to in 1910?

A. They cut the stock wider, and made them hand-stitched.

x-Q. 50. What do you mean by "hand-stitched"?

A. Hand stitch is to hold the fabric in one hand and
20 stitch with stitcher in the other hand.

x-Q. 51. I call your attention to Plaintiff's Exhibit No. 7, and ask you if that represents substantially the path of the stitcher in the operation to which you have referred in your last answer?

A. Yes, sir.

x-Q. 52. Then I understand your testimony to be that in 1910 the Diamond Company changed from the hand-spinning method to the stitching method, as indicated in this Plaintiff's Exhibit No. 7?

30 A. Over the bead.

x-Q. 53. What was the reason they gave for changing from the hand-spinning method to this other stitching method, in 1910?

A. Well, the stock—the stock was narrow; they changed and made it wider, and had to stretch it more.

x-Q. 54. And, to get this greater stretching, they used the stitching method shown in this Plaintiff's Exhibit No. 7?

40 A. Yes, at the top of the bead they done that.

Charles R. Drach for Defendant—Redirect—Recross.

x-Q. 55. And you understood that you could get more stretching with this stitching method shown in Plaintiff's Exhibit 7 than you could in the hand-spinning method? I mean that's what they told you?

A. Yes.

Cross-examination closed.

REDIRECT-EXAMINATION, BY MR. SEWARD:

10

Rd-Q. 56. What was your own experience? Could you get more stretch by spinning or stitching?

A. More stretch with spinning.

Rd-Q. 57. Do you mean to say that the inspector, George Whalen, taught you how to do this hand spinning, or that you picked it up yourself?

A. My inspector showed me.

Redirect-examination closed.

20

RECROSS-EXAMINATION BY MR. ROGERS:

Rx-Q. 58. You say that, in your personal experience, you could get more stretch by spinning than by stitching?

A. I could, yes.

Rx-Q. 59. But that was not the case with all of the other tire-makers in the Diamond Company?

A. Everybody that was spinning that I see. They must have: I didn't see them stitch any.

Rx-Q. 60. How do you know you could get more stretch by spinning than by stitching?

A. By the work.

Rx-Q. 61. You mean by the work you did on tires that you made by spinning as compared with the tires you made by stitching?

A. Yes.

Rx-Q. 62. How many tires do you think you made by stitching?

A. About three a day.

40

Charles R. Drach for Defendant—Re-redirect.

Rx-Q. 63. Did you pick up the stitching method, or were you taught the stitching method by some one?

A. I picked it up.

Rx-Q. 64. You say you were continuously in the employ of the Diamond Company from 1906 until 1910, or thereabouts?

10 A. Thereabouts, yes.

Rx-Q. 65. What other tire-making concerns have you ever been connected with here in Akron?

A. In Akron? I worked for the Goodyear about two months.

Rx-Q. 66. When was it you worked for the Goodyear Company, Mr. Drach?

A. Some time in 1914 and 1915.

Rx-Q. 67. What department did you work in at the
20 Goodyear plant?

A. Tire-building Department.

Rx-Q. 68. Do you remember the number of the department?

A. I don't remember it.

Rx-Q. 69. And that was the only time you were ever employed by the Goodyear Company?

A. That was the only time.

Rx-Q. 70. Quite sure of that, are you, Mr. Drach?

30 A. Yes, sir.

Recross-examination closed.

RE-REDIRECT-EXAMINATION BY MR. SEWARD:

R-rd. Q. 71. What is your middle name?

A. Raymond.

Re-redirect-examination closed.

Deposition closed.

Signature waived.

Cary D. Derry for Defendant—Direct.

CARY D. DERRY, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. Cary D. Derry; aged 44 years; Kent, Ohio, R. F. D. No. 9, Box 35.

Q. 2. You are employed now by The Firestone Tire & Rubber Company? 10

A. Yes, sir.

Q. 3. What work do you do here?

A. Inspecting tires.

Q. 4. Did you ever work for The Diamond Rubber Company?

A. Yes, sir.

Q. 5. When did you first go there?

A. Forepart of 1904. 20

Q. 6. What work did you do there in 1904?

A. Handbuilt tires.

Q. 7. Please describe how you put the fabric on the core in building those tires by hand.

A. Well, we pull the fabric on by hand. The core is cemented all over. We pulled it around by hand. And to stitch the fabric down you were supposed to stitch it by stroke. Practically all of them did.

Q. 8. Did you put the fabric down on the side of the core in any other way than by stitching by stroke? 30

A. Yes, spun the core, and used the stitcher.

Q. 9. Was the stitcher you used anything like Defendant's Exhibit B?

A. Practically the same kind of a stitcher.

Q. 10. When you spun the core, what position did the edges of the fabric take?

A. Kind of an upward course, flared out.

Q. 11. How fast did you spin the core?

A. Fast as we could. 40

Cary D. Derry for Defendant—Cross.

Q. 12. Just describe how you used the stitcher when you spun the core.

A. Well, spin the core, get it going as fast as you could; take your stitcher and hold it just about that angle, as near as I can tell you; be about forty-five degrees, wouldn't it?

Q. 13. Did you hold it in one hand or two?

A. Two hands.

10 Q. 14. Did you hold your hands against your body, or away from your body?

A. Both ways. Spin it down on one side, hold it like this; spin it on the other side, one side would be open, and the other side you have your body against it. That would save you time from walking clear around your tire. While spinning down one side, I would hold it against my body; and while spinning it on the other side, I wouldn't.

20 Q. 15. Did you see any other men at this time at the Diamond plant spinning down the fabric as you have described?

A. Yes, sir.

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 16. Exactly when was it that you went into the employ of the Diamond Company?

30 A. 1904. Early part of 1904. I can't give you the exact date.

x-Q. 17. And how long did you remain with the Diamond Company?

A. Practically three years.

x-Q. 18. And then where did you go?

A. Went from the Diamond to the street-car line about nine months.

x-Q. 19. And then where?

40 A. Went from there over to the Goodyear.

Cary D. Derry for Defendant—Cross.

x-Q. 20. When was it you were with the Goodyear Company?

A. Nine months after that I was with the Goodyear. I can't give you no dates on that. I thought I had them at home, but I haven't. The time I was at the Goodyear is the time they installed that new machine. I saw the first tire put up on that new machine.

x-Q. 21. What new machine do you mean, Mr. Derry? 10
Do you mean the State machine?

A. The first commercial machine they had. That's all I know about it.

x-Q. 22. Do you remember how long you were with the Goodyear Company at that time?

A. About nine months, as near as I can tell you.

x-Q. 23. When was it you went to the Diamond Company?

A. About 1904.

x-Q. 24. But you don't remember the year you were 20
in the employ of the Goodyear Company?

A. No, I don't; not the exact date.

x-Q. 25. How long were you with the Diamond Company?

A. Practically three years.

x-Q. 26. It might have been over three years?

A. No, it wasn't over three years.

x-Q. 27. You think you were nine months with the 30
Goodyear Company?

A. Yes, thereabouts.

x-Q. 28. What other occupations have you followed?

A. Well, rubber business, street-car line. I was in shoe business practically two years, when I was in business for myself.

x-Q. 29. You were a dry-cleaner, were you not?

A. Yes.

x-Q. 30. Can you give me dates of these various occupations by you? 40

Cary D. Derry for Defendant—Cross.

A. No, sir.

x-Q. 31. Your memory is not very good on dates?

A. Not very good.

x-Q. 32. When you first went with the Diamond Company, did you go at making tires immediately?

A. Yes, hand building.

10 x-Q. 33. What method were you taught when you went to the Diamond Company?

A. You was taught to pull your plies on, stitch them down with a stroke.

x-Q. 34. You mean somewhat after the fashion indicated in Plaintiff's Exhibit No. 7?

A. Yes, that's all right. Yes, sir, that's what we call the stroke.

x-Q. 35. That was the method you were taught?

A. Yes, sir.

20 x-Q. 36. Did you have any difficulty in spinning the core on the stands that were in use at the Diamond plant?

A. Only difficulty ever I had was to keep away from the boss on it.

x-Q. 37. In other words, that spinning method of making tires was not approved by the inspector, the authorities at the Diamond?

A. No.

80 x-Q. 38. And for that reason you were taught the saw tooth method?

A. Yes, sir.

x-Q. 39. How long after you went to the Diamond Company did you begin to make tires by this spinning operation?

A. O, I suppose practically after the first three months I was there.

x-Q. 40. Might have been longer than that, might it not?

40 A. Might have. As near as I could tell you.

Cary D. Derry for Defendant—Cross.

x-Q. 41. You can't approximate the date any closer than that?

A. No.

x-Q. 42. What kind of core-stands were in use at the Diamond Company?

A. Forked, solid stands; I mean a solid fork, upright, swiveled on the base.

x-Q. 43. Was the core supported on ball bearings? 10

A. No, sir.

x-Q. 44. Do you know what kind of bearings the core turned on?

A. Didn't have any bearings; had a spider.

x-Q. 45. Was the spider supported on ball bearing?

A. No, sir.

x-Q. 46. Do you know what kind of a bearing the spider has?

A. Nothing but just a common pin, iron pin about that 20
big around, inch and a half or inch and a quarter in diameter.

x-Q. 47. You say you spun the core as high a velocity as you could?

A. Yes, sir.

x-Q. 48. Why did you want to give it so high a velocity?

A. To make your number a good deal easier, to get the speed to pull the fabric down. Run it on low speed, wouldn't flare out: on high speed, it would flare out. 30

x-Q. 49. Why did you want it to flare out?

A. So the fabric wouldn't wrinkle.

x-Q. 50. In other words, it was your experience that, when the core was rotating at high velocity so as to make the fabric flare out, this operation resulted in prevention of wrinkles?

A. Yes, sir.

x-Q. 51. If you rotated the core at a less velocity, so 40

Cary D. Derry for Defendant—Cross.

that the fabric would not fan out or flare out, were you apt to get wrinkles?

A. The stitcher wouldn't take a hold. If the fabric wouldn't flare out, the stitcher wouldn't take hold. As fast as the core would go the fabric would flare out and give the stitcher a chance to take hold.

x-Q. 52. In other words, the stitcher took hold better
10 and was offered more resistance when the fabric was thrown or flared out than when the fabric was simply lying down flat along the side of the core; is that what you mean?

A. Yes, sir.

x-Q. 53. When you gave the core the highest velocity you could, did the speed die down toward the close of the operation?

A. Yes, sir.

x-Q. 54. Was it ever necessary to spin the core a
20 second time because of its tendency to stop before the spinning operation was completed?

A. Yes. Run it down on one side, and had to give it a second whirl.

x-Q. 55. What I mean is this: There was a tendency, you say, for the rotating core to slow down?

A. Yes, sir.

x-Q. 56. Was it ever necessary to give the core an
30 additional impulse, so as to enable you to complete the spinning operation on one side?

A. Yes.

x-Q. 57. Have you any idea of the amount of pressure that you exerted in holding the stitcher or forming-roll against the side of the tire?

A. That would be hard to judge.

x-Q. 58. I understand that, when you were spinning one side—

A. I should judge in the neighborhood of 25 or 30 lbs.,
40 along there, as near as I can tell you.

Cary D. Derry for Defendant—Cross.

x-Q. 59. I understand you to say that on one side of the tire you pressed your body against the stitcher?

A. Yes, sir.

x-Q. 60. And on the other side you simply held it in your hands without pressing your body against it? Do you think that would result in a difference of pressure on the two sides of the tire?

A. I don't think there would be very much of a variation.¹⁰

x-Q. 61. I understand you used this hand-spinning method only when the boss wasn't looking?

A. Yes, sir.

x-Q. 62. What would have happened if he had seen you doing it?

A. A bawling out, I suppose.

x-Q. 63. Did you use this hand-spinning operation on all sizes of tires?²⁰

A. No, sir. I used it only on three-inch tires.

x-Q. 64. Have you any idea of the weight of the fabric that you used on these three-inch tires?

A. About an eight-ounce duck, if I ain't mistaken.

x-Q. 65. Why didn't you use the spinning operation on the larger-size tires also?

A. It wouldn't work as well.

x-Q. 66. Why not?

A. Too much fabric. The wider the plies, the harder³⁰ they are to pull on by hand. We didn't have any machines in those days.

x-Q. 67. Did they use the same weight fabric on the larger tires as on the small ones?

A. Yes, sir.

x-Q. 68. In other words, they used eight-ounce duck, or thereabouts, on all sizes of tires?

A. Yes, sir.

Cross-examination closed.

Cary D. Derry for Defendant—Redirect—Recross.

REDIRECT-EXAMINATION BY MR. SEWARD:

Rd-Q. 69. When you speak of pulling the fabric on by hand, do you mean the operation of stretching it on the core?

A. Yes, sir.

Rd-Q. 70. When you were at the Goodyear plant, did you ever spin down any fabric as you have described?

A. No, I wouldn't say as I did. There wasn't enough of it to amount to anything. There was a little of it done, but I wouldn't say so.

10 Rd-Q. 71. Did you see anybody at the Goodyear plant do that?

A. Yes.

Rd-Q. 72. Was it done on the sly?

A. Yes, sir.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. ROGERS:

20 Rx-Q. 73. Can you tell me who did this hand spinning in the Goodyear plant?

A. No, I can't. Practically all new men at that time, coming and going.

Rx-Q. 74. Where did you see it done in the Goodyear plant?

A. Hand-building Room.

Rx-Q. 75. Well, you didn't do it, evidently, at the Goodyear plant yourself?

A. No, I wouldn't say that I did.

80 Rx-Q. 76. Can you tell me the name of the foreman you worked under at the Goodyear plant, in the Hand-building Room?

A. Yes, sir, Al Huguelet.

Rx-Q. 77. Mr. Huguelet is dead, is he not?

A. Yes.

Recross-examination closed.

Deposition closed.

Signature waived.

William Heller for Defendant—Direct.

Resumed, after recess. Present: as before.

WILLIAM HELLER, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. William Heller; aged 52 years; Akron, Ohio.

Q. 2. You are employed here by the Firestone Tire & 10
Rubber Company?

A. Yes, sir.

Q. 3. And are you an inspector of tire carcasses?

A. Yes.

Q. 4. How long have you been here, Mr. Heller?

A. I was here about a year or year and a half when they first started up building those tires. Then I lost my wife, and I was off from long about October till January 1st, and came back January 1, 1907.

20

Q. 5. You have been here since 1907?

A. Yes.

Q. 6. Did you ever work with The Diamond Rubber Company?

A. Yes, sir.

Q. 7. When did you work there?

A. Well, started on 1901.

Q. 8. And stayed there how long?

A. About four years.

Q. 9. What did you do at the Diamond Plant?

30

A. Well, when they first started, I was working by the day, most anything. And after they got ready to build, I started building.

Q. 10. Do you mean building tires?

A. Building tires.

Q. 11. About when did you start building tires at the Diamond?

A. Well, according to my book, the size of the tires, May 20, 1902.

40

William Heller for Defendant—Direct.

Q. 12. Just describe how you put the fabric on the core in 1902.

A. What do you mean—the pulling on of it?

Q. 13. The pulling on, and the rest of the work.

A. At that time, why, we pulled it on in first place on wooden core, and then we experimented getting it down most any ways; used to pull it down with pliers, 10 wire pliers, nail it fast with tacks, tacked it down; worked it down, stitched it down, worked the core; then we used to have a paddle there; we used to chop it down; that's what the boys used to call it them days—chop it down.

Q. 14. Did you make tires on the iron cores at the Diamond plant?

A. Yes, sir.

Q. 15. About when did you start making them on iron cores?

A. Well, that was about two years later, as near as 20 I can remember.

Q. 16. That's about 1904?

A. Somewhere along about there.

Q. 17. When you made them on the iron cores in 1904, describe how you put the fabric on.

A. We cemented the cores, pulled it on by hand, then stitched it on with the stitcher.

Q. 18. Did you ever follow any method in which the core was spun or rotated by you?

A. No, no more than spin it a certain way one way, 30 get up to it; one way so as to get at it in the right way, turn the core in this way to get at it this way.

Q. 19. Just describe to us just how you put the fabric on when you spun the core. Tell us just what you did.

A. I pulled the fabric on in the ply. Always cut in plies. And then, after the plies were on the tire, splices made, either stitch it down by hand or whirl the core, hold the stitcher against the core and spin it right down.

40 Q. 20. How fast did you whirl the core?

William Heller for Defendant—Direct.

A. O, just as fast as we could. That depends on the size of the core. Heavier the core, the faster it spun.

Q. 21. When the core was spinning fast, what position did the edges of the fabric take?

A. Straight out.

Q. 22. When you speak of spinning it down with a stitcher, do you refer to a tool anything like Defendant's Exhibit B?

10

A. Yes.

Q. 23. Did you at that time make any special stitcher of your own?

A. Yes, sir.

Q. 24. How did that differ from this stitcher Defendant's Exhibit B?

A. It is similar to that stitcher, only the wheel was larger, worked down a ply smoother than a small stitcher. If I spin the core, it wouldn't wrinkle the fabric. Would 20
run over it lots easier than those we used to have.

Q. 25. What was the diameter of the roller in this stitcher you had made for yourself?

A. $3\frac{1}{2}$ inches.

Q. 26. Why did you have that large stitcher made?

A. So I could get the work out quicker, get it down easier and quicker.

Q. 27. How did you hold the stitcher when you were spinning down the fabric?

A. I held it with both hands.

30

Q. 28. Did you hold your hands against your body or away from your body?

A. Against the body, against the shoulder.

Q. 29. At that time did you see any other men spinning down the fabric as you have described?

A. Yes, sir.

Direct-examination closed.

40

William Heller for Defendant—Cross.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 30. How do you fix the date when you began to work for the Diamond Company?

A. How do I fix the date? Why, I got it marked down in my book here, when I put down my time, in the evenings.

x-Q. 31. When did you begin to keep that book?

10 A. Well, I have always kept a book of my time since I started working. I keep my time during the day. What I do that day I generally keep. I have got a half a dozen of those books. Piece-work, make certain number of pieces, why, you don't want to miss any of the pieces.

x-Q. 32. Will you show me the entry in the book to which you refer?

A. What? The date of starting at the Diamond? Why, yes. May the 19th; that was the last day work I done. Then I started on May the 20th on piece-work, on tires. (Witness shows book to cross-examining counsel.)

x-Q. 33. This was in the year 1902, was it?

A. Yes.

x-Q. 34. What was the piece-work you started on on May 20, 1902?

A. What were the tires, you mean?

x-Q. 35. What was the kind of piece-work; what was it?

30 A. Building tires.

x-Q. 36. Were you building these tires at that time by the hand-spinning method?

A. Well, no, I don't know as I was just spinning them at that time. Just experimenting, you know. But later on when they got to them, commenced; worked it out.

x-Q. 37. How were you making tires at that time?

A. At that time we were building them on wooden core. Pulled them down with pliers. One man get on one side—generally on a table like this; one man get on one

William Heller for Defendant—Cross.

side and other on the other and pull them down with pliers, tack them down, under the bead.

x-Q. 38. Did you ever stitch tires down in the Diamond plant?

A. Yes.

x-Q. 39. Tell me briefly how you performed this stitching operation.

A. Well, we worked the stitcher with one hand, pulled on the ply with the other. Stitched it right down, with right arm to the core; stitched it right down. 10

x-Q. 40. In other words, you worked the stitcher over the tire along a path something like that I show you in Plaintiff's Exhibit 7?

A. Yes, similar to that.

x-Q. 41. Did you ever use that stitching method in connection with wooden cores?

A. Yes, sir.

x-Q. 42. And later on in connection with iron cores also? 20

A. Yes, sir.

x-Q. 43. You made all sizes of tires?

A. Yes, sir.

x-Q. 44. With that stitching method, did you not?

A. Yes, sir.

x-Q. 45. Did you make all sizes of tires also with the spinning method?

A. No. Well, up to four inch, five, five and a half, why, it was too hard to spin the core and stitch it down, too much stock there for a man with his hands. 30

x-Q. 46. In other words, you found the hand-stitching method more difficult to perform in connection with the larger-size tires because there was a greater amount of fabric to shape down on to the core; is that correct?

A. Yes.

x-Q. 47. You understand, of course, that I am now talking about the hand-spinning method?

A. Yes, sir. 40

William Heller for Defendant—Cross.

x-Q. 48. How did you make the larger-size tires that you have referred to?

A. Well, made them in different ways. I stitched them down that style (referring to Plaintiff's Exhibit 7); then, where I had good pliable stock, stitched them a part way, then spin them; done that a good many times.

x-Q. 49. You mean that, after you had stitched down
10 part way on the side of the core, then you would spin down the bead portion?

A. Yes, sir.

x-Q. 50. Were you ever employed by the Goodyear Company, of this city?

A. Yes, sir.

x-Q. 51. When was that?

A. I was there about four weeks, five, four or four and a half weeks, along 1902. Not on tire work, though.

x-Q. 52. When was it that you were absent for some
20 months from the Firestone Company after your original employment, at the time that your wife died?

A. August, 1st day of August, 1907.

x-Q. 53. And then you were away how long?

A. O, I was away before that. I was away taking care of her. She was sick in the hospital. I took care of her to home as long as I could.

x-Q. 54. Can you tell me how long you were away
altogether?

20 A. O, I was away some six or seven months, along there; I can't just state to the day.

x-Q. 55. And you came back when?

A. January 1st I came back, 1907.

x-Q. 56. And this was after your wife's death that you came back to the Firestone Company?

A. January 1, 1907, I came back to the factory, and my wife died the August before that.

x-Q. 57. Then when you said your wife died in
40 August, 1907, you made a mistake, did you?

William Heller for Defendant—Cross.

A. Yes. She died in August, and I came back on the 1st of January, 1907.

x-Q. 58. Were you continuously in the employ of the Diamond Company after you first went to it in 1901 for some time?

A. No, no. I kept changing around quite a bit there. Those rubber shops at that time didn't work steady; maybe a day's work, maybe an hour's work; didn't work 10 steady. Had to go and pick up something wherever you could.

x-Q. 59. You say your employment with the Goodyear Company was in 1904; that correct?

A. 1902.

x-Q. 60. And that was the only time you were employed by the Goodyear Company?

A. Yes.

x-Q. 61. You are absolutely certain that it was in 20 1902 that you were employed by the Goodyear Company?

A. Yes.

x-Q. 62. What time in 1902 was it?

A. Along April, May.

x-Q. 63. Might it have been June, 1902?

A. No, wasn't in June. No later than May.

x-Q. 64. And after that employment by the Goodyear Company where did you go then?

A. Back to the Diamond.

x-Q. 65. The book that you just showed me covers the 30 period that you mentioned as that when you were employed by the Goodyear Company?

A. Yes.

x-Q. 66. Will you kindly show me the entry in that book that refers to Goodyear employment at that time, in April or May, 1902?

A. April, up to the 8th day of May. From the 3rd day of April to the 8th day of May. (Witness shows book to cross-examining counsel.)

William Heller for Defendant—Cross.

x-Q. 67. You are absolutely certain that those entries refer to the year 1902, are you?

A. Yes, I am.

x-Q. 68. The reason I am asking you about the date of your Goodyear employment is because I want to compare it with the showing of the Goodyear books; and therefore I want you to be positive it was the year 1902, if that be the fact.

10 A. Well, sir, I am just as positive of that as I can be. There is the date. Of course, I am not a bookkeeper; I don't keep the dates down as a regular bookkeeper does. As near as I can recollect, it will bring it to just about to that.

x-Q. 69. When did you first use ball-bearings in the spider in the core stand at the Diamond plant?

A. Ball-bearings in the spider? Never had them when I was there.

20 x-Q. 70. Are you able to state how great a pressure, estimated in pounds, you applied to the stitcher when you held it up against the sides of the core in the hand-spinning method?

A. O, I couldn't give no pressure in pounds. I generally leaned the body against it hard as I could.

x-Q. 71. You couldn't tell within, say, 10 lbs. how much pressure you put on the stitcher?

A. No, I couldn't. Never thought of that.

30 x-Q. 72. Are you able to say whether or not the pressure was uniform on both sides of the core?

A. Well, just about.

x-Q. 73. How are you able to say that if you are unable to tell within 10 lbs. how much pressure you put on?

A. Well, we generally sat on a stool the same height on one side as the other, always held the stitcher in the same position, and the weight of a man's body would be about uniform.

40 x-Q. 74. Are you able to say whether or not the

William Heller for Defendant—Cross.

amount of pressure you applied in the hand-spinning operation was greater than or less than the amount of pressure that is now put on the arm by the weight in the present form of Firestone tire machine?

A. O, this weight, the way they put it on here with this lever, is greater than a man could put on with his hand.

x-Q. 75. Much greater?

10

A. O, considerable! Considerably greater. I don't know how much pressure they are getting on here. I wouldn't know what pressure a man was getting on in pounds. The pressure is not even on those machines here. Take dry stock, it takes a greater pressure to pull it down, and they bear on it heavier than they do on soft, pliable stock.

x-Q. 76. Did you make the same allowance for dry stock and for soft, pliable stock in the pressure you used in the hand-spinning operation?

20

A. No.

x-Q. 77. In other words, you always tried in the hand-spinning operation, to press the stitcher against the core with the same amount of force, no matter what was the nature of the fabric it was acting on; is that correct?

A. No. We just pressed on it heavy enough so as to work the plies down smoothly.

x-Q. 78. When you were holding the stitcher up against the tire, was there any tendency for the stitcher to jump away from the core when it encountered a splice? I mean, of course, in the hand-spinning operation?

30

A. Yes; that's why I generally used both hands to hold the stitcher and let it rest against the shoulder, so as to hold it steady.

x-Q. 79. When this happened, did you always succeed in getting the stitcher back to the exact same line that it was following before it struck the splice?

40

William Heller for Defendant—Cross.

A. Generally go back up to the top and down over again.

x-Q. 80. In other words, it was difficult to hold the stitcher in proper relation to the core; and, when you struck a splice and the stitcher jumped away from the tire, the easier way was to begin the spinning operation over again; is that what you mean to say?

A. Yes, sir.

10 x-Q. 81. Have you any idea what the percentage of stretch was in the original attachment of the plies to the core, in connection with the hand-spinning operation? I mean when the ply was stretched circumferentially around the core before you started to stitch or spin it down at the sides?

A. O, I don't remember what the stretch was down there; but later on, at some of those other factories, that depends upon the pliability and greenness of the fabric.
20 Take some fabric that is green and soft, will go down much further than that which is dry.

x-Q. 82. You cannot estimate, then, the percentage of original stretch at the Diamond factory?

A. No.

x-Q. 83. Do you think the stretch that was then given the fabric was as great as that that is now used in the ordinary tire machine such as the Firestone machine here?

30 A. Yes, we used to get as much stretch by pulling it on as they are giving it here on the machine. Pulling it on, I have taken out two and a half inches to the foot. I have pulled it down there when a man held a crowbar against the stand.

x-Q. 84. Was that the usual practice?

A. O, no! that wasn't the usual practice; but we have tested it out that way.

x-Q. 85. Do you think you got as much as a 14% stretch in connection with the old hand-spinning operation?
40 ation?.

Louis Stark for Defendant—Direct.

A. How much is that per foot?

x-Q. 86. It's the amount you are getting here on the Firestone machine.

A. Yes, I guess we did.

x-Q. 87. Did you use the same kind of fabric then that you are now using in the Firestone plant?

A. Well, as the fiber is concerned, I don't know; the heft of it was practically the same on the same ply tires 10 they are making here.

x-Q. 88. And what is the weight of the fabric which they are now using here?

A. I can't tell you that. I have nothing to do with that part.

x-Q. 89. Have you no idea whether it is 10-ounce duck or 14-ounce duck or 18-ounce duck?

A. No, sir.

Cross-examination closed.

20

Deposition closed.

Signature waived.

LOUIS STARK, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence. 30

A. Louis Stark; 40 years of age; Akron, Ohio.

Q. 2. You are employed by The Miller Rubber Company, of Akron?

A. Yes, sir.

Q. 3. What position do you hold there?

A. General Tire Department foreman.

Q. 4. How long have you been with the Miller Company?

A. Ten years.

40

Louis Stark for Defendant—Direct.

Q. 5. Where were you before that?

A. Diamond Rubber Company.

Q. 6. How long were you there, please?

A. As near as I can figure, about 11 years.

Q. 7. When you were at the Diamond plant did you make tires by hand?

10 A. Yes, sir.

Q. 8. About when did you begin making tires by hand at the Diamond Company?

A. About the year 1901 and 1902.

Q. 9. Did you make them on iron cores?

A. Made them on wooden cores first.

Q. 10. When did you begin making them on iron cores at the Diamond?

A. I think I worked there about a year building tires on wooden cores.

20 Q. 11. So that would make it about what year you began making them on iron cores?

A. I should think, to be safe about that, 1903.

Q. 12. When you made them on the iron cores, just describe how you put the fabric on the core at the Diamond plant.

A. We pulled the fabric on by hand. The first ply was made up in an endless band.

Q. 13. How did you get the other plies on?

30 A. Pulled them on by hand.

Q. 14. How did you form the edges of the fabric down on the side of the core?

A. Well, there is a number of ways you could do that. I used to do it the quickest way—spinning the core, holding your stitcher on the side of the fabric and running the ply down.

Q. 15. When did you do this at the Diamond?

40 A. Well, I started it right after I started to build tires there on iron cores.

Louis Stark for Defendant—Direct.

Q. 16. That would be in the year 1903?

A. Yes, about that time.

Q. 17. How fast did you spin the core?

A. Well, now, I don't know as I can say just how fast the core was going; but you had to spin it just as fast as you could possibly get it to spin.

Q. 18. When the core was spinning fast, what position would the edges of the fabric take?

10

A. Well, the faster you would spin the core, the fabric would stand out like this,—right out straight from the core.

Q. 19. When you speak of spinning it down with a stitcher, do you refer to a tool anything like Defendant's Exhibit B?

A. Just exactly.

Q. 20. Did you see any other men doing this same spinning operation at the Diamond at that time?

20

A. Lots of them.

Q. 21. After you came to the Miller Company ten years ago, did you make any tires by hand?

A. Made them all by hand.

Q. 22. Did you spin the fabric down as you have just described when you were at the Miller Company?

A. Sometimes.

Q. 23. When you were spinning down by hand, how did you hold the stitcher, in one hand or by both?

A. One hand you hold the stitcher. You could sit 30
aside of your tire, spin your tire with your left hand if you was righthanded, and run your ply down with your stitcher.

Q. 24. Is that the way you did it at the Diamond Company?

A. Yes.

Direct-examination closed.

Louis Stark for Defendant—Cross.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 25. Do you think you were able to press the stitcher against the core with the same amount of pressure as that now ordinarily imparted to a spinning or forming roll in the present well-known form of carcass-making machine?

A. Well, I think I could, yes.

10 x-Q. 26. Notwithstanding the fact that you held the stitcher in one hand and did not press it up against the body?

A. Didn't have to press it up against the body.

x-Q. 27. In other words, you relied simply on the muscular power in your arm and hand?

A. Yes.

x-Q. 28. Have you any idea what amount of pressure you were able to impart to the stitcher in the way you have described?
20

A. Well, no, not exactly. I couldn't say how much pressure I did put on. I never had any idea at all. I always got enough on there to get them down where they should be.

x-Q. 29. Do you think you were able in this manner, and holding the stitcher as you have described, to make the pressure uniform, or, in other words, the same at all times, and on all tires, and on both sides of the tire?

30 A. I could have at that time. I haven't done any of that work for a good many years.

x-Q. 30. How do you know that this pressure was uniform as you have described it?

A. Well, you would always know that after you got your band ply down, after you got your ply down.

x-Q. 31. I take it you did not exert your full strength in pressing the stitcher against the core?

A. That's a question I don't think I could answer.

x-Q. 32. I suppose, if the pressure had been too great,
40 it might have retarded the rotation of the core?

Louis Stark for Defendant—Cross.

A. Well, I don't think so, because it kept on spinning all the time.

x-Q. 33. You don't think you could have pressed hard enough to slow down the core in its rotation?

A. That all depends on the one arm. What I meant by that, if you didn't keep on spinning it, of course, your tire would stop. You had to keep on spinning it all the time while you were stitching the tire down. 10

x-Q. 34. Then you did not rely on giving the core a great momentum at the start, and allowing it to run until you got through with the stitching operation, but rather kept accelerating the core during the stitching operation; is that what you mean?

A. Kept on spinning the core all the time you were stitching the ply down.

x-Q. 35. Have you any idea how fast you rotated the core during the operation you have described? 20

A. No, I haven't.

x-Q. 36. Do you think it was as high as 120 revolutions a minute?

A. Well, now, I couldn't say to that at all, because I don't know.

x-Q. 37. Do you think it was as high as the rate of speed of rotation that is now given the core in ordinary carcass-making machines?

A. At different times it was. When you started the 30 tire, why, you went pretty fast.

x-Q. 38. And then after that it got slower, did it?

A. Well, it just depended on how hard you pressed on your stitcher whether it got slower.

x-Q. 39. Then the pressure of the stitcher would have an effect at times of slowing the core down in its rotation?

A. If you didn't keep spinning it very fast with your other hand, it would. 40

Louis Stark for Defendant—Cross.

x-Q. 40. And it would certainly have this effect when an operator used both hands to hold the stitcher?

A. You couldn't hardly do that.

x-Q. 41. Couldn't hardly do what?

A. Hold the stitcher with both hands and spin the core.

x-Q. 42. Will you kindly explain what you meant by your last answer?

10 A. I thought you asked me wether you held the stitcher with both hands. You don't. You only hold it with one hand.

x-Q. 43. Was that the general practice in the Diamond plant,—to hold the stitcher with one hand and turn the core with the other hand?

A. It was with them that was doing it.

x-Q. 44. Doing what?

A. Running the ply down, spinning the core.

20 x-Q. 45. In other words, the hand-spinning practice in the Diamond plant at the time you refer to was for the operator to hold the stitcher in one hand and simultaneously turn the core with the other hand; is that correct?

A. Yes.

x-Q. 46. When was it that you entered the Diamond employ?

A. Well, I ain't sure whether it was 1901 or 1902.

30 x-Q. 47. Is your memory pretty good on dates?

A. Why, I don't know. I don't think it's the best in the world on dates.

x-Q. 48. Were you ever employed in the Goodrich factory?

A. As a kid I was. Not on tires.

x-Q. 49. When was that?

A. In 1892.

x-Q. 50. You were never in the employ of the Goodrich Company after that time?

40 A. No.

Louis Stark for Defendant—Cross.

x-Q. 51. When you went to the Diamond Company, what branch of the manufacture were you first assigned to?

A. Bicycle-tire Department.

x-Q. 52. You did not make these bicycle tires by the spinning method, did you?

A. Made them on a pole.

x-Q. 53. I take it that later on you were transferred 10
from the Bicycle-tire Department to the Automobile Tire Department?

A. Yes.

x-Q. 54. And when was that transfer?

A. I don't just exactly know. I think I built bicycle tires about two years.

x-Q. 55. Which would make the date of the transfer when?

A. I don't think I could tell you exactly, not exactly. 20

x-Q. 56. You have already testified, have you not, that you began making tires in 1901 and 1902?

A. Somewheres along there. I did not say the exact year.

x-Q. 57. You are reasonably sure it was between 1901 and 1902?

A. 1901 and 1903.

x-Q. 58. And it might have been even later than that, as late as 1903?

A. I wouldn't say for sure, but I don't think it was. 30

x-Q. 59. How long after you were transferred to the Automobile Shoe Department was it before iron cores were introduced?

A. I don't know as I can give you any exact time on that.

x-Q. 60. Did you ever, previously to to-day, make an affidavit covering the facts concerning the facts about which I am now inquiring?

A. I think I did, yes.

Louis Stark for Defendant—Cross.

x-Q. 61. You refer, do you not, to an affidavit made by you on the 1st day of December, 1917, in a case which I shall briefly entitle "*Firestone vs. Seiberling*"? You remember it, don't you, Mr. Stark?

A. Yes.

x-Q. 62. You said in that affidavit that you entered the employ of the Diamond Company in the year 1900.
10 Is that statement correct?

A. As near as I know, it is.

x-Q. 63. You also said in that affidavit that about the year 1903 you were transferred from building bicycle tires to making automobile tire casings. Was that statement correct?

A. I guess about as near as I can figure out.

x-Q. 64. You also stated in that affidavit that, when you started in this work, they were manufacturing tires
20 on wooden cores, but, after about a year, an iron core similar to that now in use was introduced. Was that statement correct?

A. Don't know whether the time was just exactly correct. Can't say right to the day nor the hour nor the month.

x-Q. 65. In that affidavit you also fixed the date for spinning tires in the manner described by you as the year 1904. Is that correct?

A. Well, we got to doing it right along. I don't know
30 whether it was 1904, or 1903, or 1902. I know I got it when I started over there.

x-Q. 66. You have said in your testimony to-day that you began making tires by hand at the Diamond Company in the year 1901 and 1902.

A. Well, maybe I did.

x-Q. 67. Well, maybe you did what,—maybe you said it, or maybe you started?

A. Maybe I started to make tires.

40 x-Q. 68. Notwithstanding the fact that, in the earlier

Louis Stark for Defendant—Cross.

affidavit, you said that it was about the year 1903 that you were transferred from building bicycle tires to making automobile tire casings?

A. That's as near as I can figure it out.

x-Q. 69. As a matter of fact, you are not even certain to-day exactly when it was that this happened?

A. When I was transferred over? I can't tell you the day, and I can't tell you the year, right now; but it was around that time. 10

x-Q. 70. And it was not until a year after that that iron cores were introduced?

A. Well, I couldn't say how long it was, because I don't remember.

x-Q. 71. That is what you said in the affidavit. How do you account for that?

A. Well, I tried to give it to you as near as I could. That's a long time to remember. 20

x-Q. 72. I suppose you realize that there is some little conflict between the facts as you have stated them in the affidavit and the facts as you have testified to them to-day, do you not?

A. I don't know whether there is or not.

x-Q. 73. At the Diamond works did you ever make automobile tires casings in any other way than by the hand-spinning method?

A. Yes. 30

x-Q. 74. What was the other way?

A. Stitch your ply down with one hand, and pull your ply down with the other hand to the place where it belongs.

x-Q. 75. In this stitching operation to which you refer did you move the stitcher in a path substantially like that shown you in the sketch Plaintiff's Exhibit No. 7?

A. Something similar to that, yes.

Cross-examination closed.

Louis Stark for Defendant—Redirect—Recross.

REDIRECT-EXAMINATION BY MR. SEWARD:

Rd-Q. 76. In the affidavit to which counsel has referred you also said, "I am able to positively fix the date 1904 as a date at which time I was spinning tires in the manner indicated, as I was married in December of that year and I know that I had been making tires by hand and spinning them on iron cores for some time before the date of my marriage." That's correct, is it not?

10

A. Yes.

Rd-Q. 77. Mr. Stark, it is a fact that you are an unusually large and strong man, isn't it?

A. I always have been.

Rd-Q. 78. You weigh over 200 lbs., don't you?

A. Yes, sir, 242.

Rd-Q. 79. In the tire-making machines with which you are familiar, are the stitching-rolls pressed in against the fabric on the core by the operator himself?

20

A. Yes, sir.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. ROGERS:

Rx-Q. 80. You mean to say you are not familiar with any tire-making machines wherein the rolls are pressed in by springs or weights?

A. The only machines I ever worked around are the ones I am working around now.

30

Rx-Q. 81. Did you ever see any machines in which the rolls are pressed inwards by springs or weights?

A. Yes.

Rx-Q. 82. What machines do you refer to in your last answer?

A. I have seen our own machines.

Rx-Q. 83. And are those machines the only ones in which the rolls are pressed inwards by springs or weights, which you have seen?

40

A. They are the only machines I have seen.

William G. Green for Defendant—Direct.

Rx-Q. 84. I ask you once again to tell me whether or not you have ever seen a tire-making machine in which the rolls were pressed inwards by springs or weights, other than the machines you refer to as your own machines?

A. I seen the Thropp machine.

Rx-Q. 85. Are the rolls pressed inwards there by springs or weights?

A. Yes.

10

Rx-Q. 86. Now, have you ever seen any other machine in which the rolls are pressed inwards by springs or weights?

A. No.

Rx-Q. 87. Have you ever seen a Goodyear machine?

A. No.

Rx-Q. 88. Have you ever seen a Goodyear machine in the shop or shops of any of the Goodyear licensees?

A. No.

20

Rx-Q. 89. Have you ever seen a Firestone machine?

A. No.

Recross-examination closed.

Deposition closed.

Signature waived.

Adjourned until the following morning at 9:30 o'clock.

30

Resumed, pursuant to adjournment, Wednesday, April 30, 1919, at 9:30 o'clock A. M. Present: as before.

WILLIAM G. GREEN, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. William G. Green; aged 46 years; Akron, Ohio. 40

William G. Green for Defendant—Direct.

Q. 2. You are employed by The Firestone Tire & Rubber Company?

A. Yes.

Q. 3. And are you an inspector of tire carcasses?

A. Yes, sir.

Q. 4. How long have you been employed by the Firestone Company?

10 A. 1906.

Q. 5. You have been here since 1906?

A. Yes.

Q. 6. Do you know Mr. William Heller?

A. I do.

Q. 7. Was he here when you came here?

A. Yes, sir.

Q. 8. Had you been employed by The B. F. Goodrich Company before you came to the Firestone Company?

20 A. Yes, sir.

Q. 9. Did you make automobile tires at the Goodrich Company?

A. I did part of the time.

Q. 10. Did you make these on iron cores?

A. Yes, sir.

Q. 11. Will you please describe how you put the fabric on the cores when you made tires on iron cores at the Goodrich plant?

30 A. We hung a core up on posts. We had posts with pins sticking out, and we hung it up by hand and pulled the fabric on.

Q. 12. Do you mean that you hung the core on the pin?

A. Yes, sir.

Q. 13. And that you pulled the fabric on the core by hand?

A. Yes, sir.

Q. 14. After you had pulled the fabric on the core, how did you get the edges of the fabric down on the
40 sides of the core?

William G. Green for Defendant—Direct.

A. We had to spin the table around and stitch it down by hand.

Q. 15. What do you mean by the "table"?

A. Why, we had a revolving table, and use a paddle sometimes, and lots of times we used the stitcher most of the time, well, biggest part of the time.

Q. 16. How did you turn the core?

A. Why, was a ball-bearing table, and they whirled it, 10 see? get it going fast, and they held the stitcher there.

Q. 17. Did you do that yourself?

A. Yes, sir.

Q. 18. Do you mean the core was on the table?

A. Yes, sir.

Q. 19. When you had it whirling fast, what position did the edges of the fabric take?

A. Well, the upper edge of the fabric on top would flare up, naturally.

Q. 20. How did you hold the stitcher? 20

A. Why, kind of a slanting position, and then shove stitcher right straight down to bead line.

Q. 21. Did you hold the stitcher in one hand or two?

A. Well, sometimes we would hold it in one, and sometimes two.

Q. 22. Was the stitcher you used anything like this tool, Defendant's Exhibit B?

A. Yes, sir, practically the same thing. Of course, 30 different sizes of them sometimes.

Q. 23. Did you see any other men at the Goodrich plant stitch down the fabric by whirling the core as you have described?

A. Yes, sir.

Q. 24. When you came to the Firestone Company, in 1906, what work did you do?

A. Building tires.

Q. 25. How did you put the fabric on the core when you built those tires? 40

William G. Green for Defendant—Cross.

A. Hung them up on stand. We had a stand, upright stand; pull them on by hand same as the other.

Q. 26. How did you stitch the fabric down?

A. Why, stitch them down with stitcher. Hold the stitcher right on. Was handier than the other way.

Q. 27. State whether or not you whirled the core?

A. We did. Well, not when you pull on the fabric.

10 When you done the stitching.

Q. 28. How fast did you whirl the core?

A. As fast as we could whirl it. The faster the better.

Q. 29. And, in making those tires, did you hold the stitcher in one hand or in two?

A. Usually in one hand.

Q. 30. Was that stitcher similar to this Defendant's Exhibit B?

A. Yes, sir.

20 Q. 31. Did you see any other men at the Firestone plant in 1906 stitching down the fabric in that way?

A. I did.

Q. 32. When you whirled the core in stitching at the Firestone plant, what position did the edges of the fabric take?

A. Naturally flared out.

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

80 x-Q. 33. You have spoken of another way of laying the fabric down on the sides of the core. What was that other way?

A. Well, what do you mean, Goodrich or Firestone?

x-Q. Both?

A. Why, at the Goodrich there was only one way. We laid it on the table and whirled the core and the table, and stitched the plies down.

40 x-Q. 35. Was that the case with all sizes of tires at the Goodrich plant?

William G. Green for Defendant—Cross.

A. On different sizes that I worked on it would work out that the smaller tire would work better.

x-Q. 36. Did all the workmen in the Goodrich plant operate in the manner you have described, on all kinds of tires, and in that way only?

A. I couldn't answer that; I don't know.

x-Q. 37. You never saw a tire made in the Goodrich plant except in the manner that you have described, 10 namely, where you whirled the core around on a horizontal table?

A. There were tires made there; they got a different stand after that, an upright stand; they could lay it down or stand it up,—a later model.

x-Q. 38. Well, admitting that there were two kinds of core supports, one the flat, whirling table, and the other the stand that could be adjusted to different positions, I am now asking you whether or not you ever saw a tire 20 made in the Goodrich factory in any other way except by the spinning operation?

A. Not these certain kind of tires I didn't.

x-Q. 39. I now ask you again whether or not you ever saw any kind of tires made in the Goodrich factory by any other method than the spinning operation which you have described?

A. Yes, sir.

x-Q. 40. Now tell me about it, what it was.

A. Why, the bicycle tires we used to make on cores 30 or drums or different ways of making tires.

x-Q. 41. Then bicycle tires were the only tires that were made in the Goodrich plant in any other way except by the spinning operation that you have already described; is that correct?

A. Pretty large plant! don't know whether they made any other different than where I was, or not.

x-Q. 42. Did you ever see a tire stitched down in the Goodrich plant?

William G. Green for Defendant—Cross.

A. Why, that's what we called stitching them down. That's what I described.

x-Q. 43. I show you a sketch, Plaintiff's Exhibit No. 7; and ask you to state whether or not you ever saw a ply laid down on the side of a core by the stitcher following a path substantially like that shown in exhibit. I am referring, of course, to your experience in the Goodrich plant prior to 1906.

10 A. I have saw them made that way, I know.

x-Q. 44. Then your previous answers were erroneous, were they?

A. Large-size tires.

x-Q. 45. Then your previous answers were wrong, were they?

A. How do you mean wrong?

x-Q. 46. In other words, then, there were at least two methods of stitching down the fabric on the sides of the
20 core that were in use at the Goodrich plant at the time you were there?

A. Well, the men worked different; they had different methods, yes, of stitching them down.

x-Q. 47. Some men, then, spun the tire down; and others stitched them down by the sawtooth method; is that correct?

A. Well, I expect—I think it is all right; some of them worked them down that way.

30 x-Q. 48. Did you ever see anybody work down a tire in the Goodrich plant by that sawtooth method?

A. I did.

x-Q. 49. Notwithstanding the fact that you stated, in your answer to x-Q. 41, that it was a pretty large plant, and you "don't know whether they made any other different than where I was, or not". That answer was incorrect, was it?

A. Why, what way do you mean?

40 x-Q. 50. Do you still state that, because the Goodrich

William G. Green for Defendant—Redirect.

plant was a large one, you don't know whether or not, in other parts of the shop, tires were made in any other way except by the spinning operation, as substantially stated by you in your answer to x-Q. 41?

A. I still claim that's the only way I knew of them making the tires.

x-Q. 51. Then what becomes of your answer to x-Q. 48, in which you stated that you actually saw tires worked down in the Goodrich plant by the sawtooth method? 10

A. I told you that they worked them both ways.

x-Q. 52. And you saw them work them both ways?

A. Yes.

x-Q. 53. Now, what kind of tires did you see made by the sawtooth method?

A. What do you mean—automobiles or bicycles?

x-Q. 54. I repeat my question. What kind of tires did you see made by the sawtooth method?

A. Automobile tires. 20

x-Q. 55. All sizes of automobile tires?

A. Yes, as far as I knew they was making them all.

x-Q. 56. Did you ever make a tire by the sawtooth method?

A. Some plies I have stitched down that way, yes, sir.

Cross-examination closed.

REDIRECT-EXAMINATION BY MR. SEWARD:

Rd-Q. 57. Do you mean by your testimony that some of the piles were put down by whirling the core, and some of the plies put down by the sawtooth method? 30

A. I do.

Redirect-examination closed.

William G. Green for Defendant—Recross.

RECROSS-EXAMINATION BY MR. ROGERS:

Rx-Q. 58. Do you mean that, in the same tire, some of the plies were laid down by whirling the core, and other plies were laid down by the sawtooth method?

A. I seen it done that way, yes, sir.

Rx-Q. 59. Was that the general practice,—to lay down part of the plies by the sawtooth method and part by the spinning method?

10 A. Yes, they worked a good deal like that.

Rx-Q. 60. Is that what you used to do yourself?

A. I worked like that myself.

Rx-Q. 61. Now tell me which plies you laid down by the sawtooth method, and which plies the spinning method.

A. Wouldn't make any particular difference either way, which plies I did.

Rx-Q. 62. Then, in making tires, you simply mixed up
20 the two methods as your fancy dictated; is that correct?

A. Yes, sir.

Rx-Q. 63. In other words, sometimes, when you felt like it, you would run down a few plies by one of the methods, and then run down the remaining plies by the other method; is that correct?

A. That's the way we worked.

Rx-Q. 64. Did your inspector know that you were mixing the two methods in the same tire?

30 A. Couldn't help but see us. He was right around there all the time.

Rx-Q. 65. And he approved of this way of mixing the two methods in the same tire, did he?

A. He never said anything about it to us, whether it was right or wrong.

Rx-Q. 66. Then it was a mere whim of your fancy whether to use the spinning method or the sawtooth method?

40 A. Well, if it wasn't right he would have told us to stop, I suppose.

William G. Green for Defendant—Recross.

Rx-Q. 67. I repeat the question. Then it was a mere whim of your fancy whether to use the spinning method or the sawtooth method?

A. We supposed it was right, and convenient to do that.

Rx-Q. 68. Please tell me why it was convenient to mix the two methods.

A. We could stitch down faster with a hand-stitcher. 10

Rx-Q. 69. Then, if it was quicker, why didn't you use it throughout the tire and not use the other one at all?

A. Well, I don't know why; we mixed the two methods together, that's all; I don't know why we did do it.

Rx-Q. 70. Did you make any tires at the Goodrich plant entirely by the sawtooth method, without any spinning in it at all?

A. No, we had to spin them.

Rx-Q. 71. Why did you have to spin them?

20

A. To run down our plies.

Rx-Q. 72. You couldn't lay down the ply by the sawtooth method?

A. O, it might be done, I suppose!

Rx-Q. 73. Wasn't it frequently done at the Goodrich plant? I mean, Did not tire-makers at the Goodrich plant frequently lay down plies by the sawtooth method?

A. I don't know that; I couldn't tell you whether they did or not.

Rx-Q. 74. Haven't you already said that you did it 30 yourself?

A. It could be done, I suppose.

Rx-Q. 75. I repeat the question. Haven't you already said that you did it yourself?

A. I put part of the plies down that way; and could put them all down, I suppose, if I wanted to.

Rx-Q. 76. When you were in the Goodrich plant, did any one instruct you how to lay down the plies of the tire?

40

William G. Green for Defendant—Recross.

A. Why, we used stitcher when we can, and the paddle when we could. Those were the most convenient. That's the only instructions I had.

Rx-Q. 77. When you refer to the use of a paddle, you mean using the paddle according to the sawtooth method, do you not?

A. Well, no, that doesn't describe it exactly.

Rx-Q. 78. Well please describe the use of the paddle
10 that you have just referred to.

A. Why, we used to take and push it straight down with the paddle to the bead line.

Rx-Q. 79. Did you lay down many plies by the use of the paddle in that way?

A. We laid down part of them that way, and part of them the other way,—with the stitcher.

Rx-Q. 80. Did you ever use the stitcher to work the
ply down on the side of the tire substantially along the
20 sawtooth path?

A. Yes.

Rx-Q. 81. Now tell me, please, how you spun down the plies on large-size tires.

A. Well, I worked on small sizes when I was there, mostly.

Rx-Q. 82. Did you never make large-size tires in the Goodrich plant?

A. As far as I remember, I don't believe I made over
a 4-inch tire down there.

30 Rx-Q. 83. How did the other tire-makers at the Goodrich plant lay down the plies on the large-size tires?

A. I wouldn't want to say how they put them down; for I don't know.

Rx-Q. 84. Don't you remember, or did you never see a large-size tire made in the Goodrich plant?

A. They worked up in the other end of the room from where our small tires were.

Rx-Q. 85. Did you ever see a large-size tire made in
40 the Goodrich plant?

William G. Green for Defendant—Recross.

A. I have seen them working on them, but I didn't get down to see just how they did that part of it.

Rx-Q. 86. Then you don't know whether the large tires were made in the Goodrich plant by the sawtooth method, or how they were made?

A. I wouldn't want to say that I knew how they were made.

Rx-Q. 87. I repeat the question. Then you don't 10 know whether the large tires were made in the Goodrich plant by the saw tooth method, or how they were made?

A. I will answer that, No.

Rx-Q. 88. Did you ever make any large-size tires at all at the Goodrich?

A. Nothing above four, to my knowledge.

Rx-Q. 89. If it was quicker to use the spinning method, why did you mix in the sawtooth method with it?

A. All depends on the condition your cores were or fabric. Sometimes one would work better, sometimes the 20 other.

Rx-Q. 90. When would the sawtooth method work better?

A. Why, if the fabric was stiff and hard, it would be easier to get it down that way.

Rx-Q. 91. Wouldn't you have the same kind of fabric throughout a single tire?

A. The conditions of your fabric differ a lot of times coming from the Mill Room. 30

Rx-Q. 92. Would the conditions vary in the different plies of the same tire?

A. It does, often.

Rx-Q. 93. Therefore, when you were handling a layer of fabric that was stiff and hard, you would use the sawtooth method to shape it down?

A. Yes, sir. It would work it better that way.

Rx-Q. 94. What did you call, in the Goodrich plant, the method of laying down the fabric on the side of the 40

Warren C. Gregg for Defendant—Direct.

core, which we have been naming here the "sawtooth method," as shown in Plaintiff's Exhibit No. 7?

A. Well, I wouldn't know what they did call it, really. Give you a stitcher and a paddle and a set of tools and tell you to go to it.

Rx-Q. 95. Suppose you had wanted to describe that sawtooth method in the Goodrich plant, what would you
10 have termed it?

A. Using a paddle would be the only thing, or stitching it down, the only thing I would know to call it.

Recross-examination closed.

Deposition closed.

Signature waived.

WARREN C. GREGG, the next witness called on behalf
20 of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. Warren C. Gregg; aged 47 years; Akron, Ohio.

Q. 2. Are you employed by The Firestone Tire & Rubber Company?

A. Yes, sir.

Q. 3. What's your position here?

30 A. Inspector of tires.

Q. 4. How long have you been employed here?

A. Be eight years in next July.

Q. 5. Before you came here did you work for The Diamond Rubber Company?

A. Yes, sir.

Q. 6. When did you leave the Diamond's employ?

A. I left the Diamond—now, I was there twice.

Q. 7. When did you leave the last time?

40 A. In 1911.

Warren C. Gregg for Defendant—Direct.

Q. 8. When did you leave the first time?

A. 1907.

Q. 9. When you were at the Diamond the first time, did you make tires by hand?

A. Yes.

Q. 10. Please describe how you put the fabric on the core in making those tires.

A. We had, to start with, a band; it was an endless 10 band; that two of us stretched over a core. Then we worked it down with a stitcher.

Q. 11. Describe how you worked the fabric edges down on the sides of the core with the stitcher.

A. Well, if we worked it down according to our instructions, it was done with stroke. Often they would spin the core, and then would hold the stitcher against the sides of the core; hold the stitcher there—of course, if we had speed enough to start with, we would run it 20 clear down.

Q. 12. Clear down to what?

A. Bead line. Generally a little below.

Q. 13. How fast did you spin the core?

A. Well, we figured on spinning it fast enough to make it run until we got this fabric run down to the bead line.

Q. 14. When the core was spinning, what position did the edges of the fabric take?

A. Why, ordinary stand straight out, flare out. 30

Q. 15. Was the stitcher you used anything like this tool, Defendant's Exhibit B?

A. Very much like it, but it didn't have the ball-bearings.

Q. 16. Did you hold the stitcher in one hand or two?

A. Two.

Q. 17. Did you see any other men spin down the fabric in this way at that time?

A. Yes, sir. 40

Warren C. Gregg for Defendant—Direct.

Q. 18. At any time before you left the Diamond Company the first time, which you have said was in 1907, did you make tires on a core that was driven by a belt?

A. Yes, sir.

Q. 19. Now, please describe what you did in making tires on that core; I mean in pulling the fabric on. Describe the core, and how it was driven.

10 A. The core was hung on a spindle of the tread machine; and we stretched the band over by hand the same as we did on all of the others; and the next ply was pulled on by hand; and then, in running that ply down, I used the stitcher, while the tire was in motion.

Q. 20. How was the belt arranged?

A. We had tight and loose pulleys.

Q. 21. Do you know how fast it was driven by the belt?

20 A. No, I couldn't tell you.

Q. 22. When it was in motion, in what position were the edges of the fabric?

A. Be flaring out.

Q. 23. What kind of a stitcher did you use in putting down those fabric edges?

A. Used common stitcher like that (witness pointing to Defendant's Exhibit B). I also had a stitcher made, a concave stitcher, concave edge. That was used for turning the fabric over the tip of the bead.

30 Q. 24. How did you hold the stitcher that was like Defendant's Exhibit B when making the tires on this belt-driven core?

A. Sometimes I held it with both hands like that, and other times I used a fork that I got there, for a rest; and I could also get more pressure to steady it.

Q. 25. How far down did you spin the fabric on the sides of the core in that way?

A. Before the beads were put on, I stitched it down
40 to the bead line, or below.

Warren C. Gregg for Defendant—Cross.

Q. 26. About how long were you using that belt-driven core as you have described?

A. I think about a month.

Q. 27. Are you sure that was before you left the Diamond, in 1907?

A. Yes, sir.

Direct-examination closed.

10

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 28. You have referred to the method you were taught when you went to the Diamond Company. Did that method involve the use of the stitcher in a saw tooth path substantially like that shown in the sketch Plaintiff's Exhibit No. 7?

A. Yes.

x-Q. 29. You have spoken about pulling the fabric 20 on to the core by hand. Have you any idea what percentage of stretch you gave the fabric in pulling it on?

A. I haven't.

x-Q. 30. In using the hand-spinning method you have been talking about, did you use it on all sizes of cores?

A. No, sir. Only on the smaller sizes, anything from 4-inch down.

x-Q. 31. Why didn't you also use it on the larger-size cores?

A. My reason was that it took too long to get a large 30 core in motion.

x-Q. 32. In other words, you found difficulty in spinning the heavier cores?

A. Yes, sir.

x-Q. 33. Is that the only reason?

A. Well, I couldn't say positively that it is. The only other reason that I can think of is the different shapes of different cores.

40

Warren C. Gregg for Defendant—Cross.

x-Q. 34. Were the larger-size cores of different shape from that of the small-size cores?

A. I think they were.

x-Q. 35. What kind of tires did you make then, straight side, clinchers, or what?

10 A. I never made any straight-side tires. They were clincher tires; that is, what I experimented on with the power-driven core.

x-Q. 36. I was referring more particularly to the tires which you made by the ordinary hand-spinning method. What were they—straight-side or clinchers?

A. Mine were all clinchers.

x-Q. 37. Even earlier than 1907?

A. Yes, sir.

20 x-Q. 38. In using the spinning method on the larger-size tires, did you have any other difficulty than that involved in imparting the proper momentum to the heavy core?

A. Yes, sir.

x-Q. 39. What were these other difficulties?

A. We had the difficulty of keeping the fabric from—well, you might say wrinkling.

x-Q. 40. There was a tendency to wrinkle, was there, in the plies of the larger-size tires?

A. Yes, sir.

30 x-Q. 41. Do you know why that difficulty arose?

A. On account of the more stock, it seems, to be worked in the same surface. Now, what I mean by the larger tire doesn't mean large in one way. Now, you take a 36 or a 37 x 4, they work very nicely in the spinning method; but a 36 or a 37 x 5 or 5½ would be more difficult.

x-Q. 42. If I understand you correctly, what you mean to say is, that, in the tires of larger cross-section, there
40 was more fabric to lay down; and, for that reason, it

Warren C. Gregg for Defendant—Cross.

was more difficult to do it by the spinning method; is that correct?

A. That expresses the idea, yes.

x-Q. 43. In connection with these tires of larger cross-section, when you pulled the strip on to the core, there would be a greater amount of side-stretch along the edges of the strip, would there not, than in connection with cores of smaller cross-section?

10

A. I don't believe that one answer can be applied to all cores. I think there would be more loose fabric in a large tire on the edges of the ply; I mean on large cross-section tire.

x-Q. 44. And this rendered more difficult the subsequent absorption of this fullness in the sides of the tires?

A. Well, you are right. There is a point, probably, you may not know in this tire business. Now, for instance, in some of these larger sizes the bead is set further in from the outer periphery of the core; and consequently there was more fabric to absorb.

20

x-Q. 45. And consequently, in these cases, you applied the skirts of the ply to the sides of the core, or of the tire, by the sawtooth method of stitching?

A. Supposed to.

x-Q. 46. How do you fix your dates as given by you in your direct testimony? By memory alone?

A. Not entirely. I have a record of some of my work and dates.

x-Q. 47. What was the exact date, for instance, when you worked on this experiment with the belt-driven core?

A. I wouldn't attempt to give you the exact date.

x-Q. 48. Well, can you give the year?

A. Not positively.

x-Q. 49. You say you worked on it about thirty days, to the best of your recollection?

A. About that.

40

Tod J. Mell for Defendant—Direct.

x-Q. 50. And then what line of work did you take up?

A. I went back to building the ordinary way, customary.

x-Q. 51. Coming back now to the so-called "hand-spinning operation," have you any idea with what degree of pressure you held the stitcher against the core?

10 A. No, sir, I couldn't answer it in pounds.

x-Q. 52. I suppose that, if you pressed too hard, there would be a liability to slacken down the speed of the core, would there not?

A. Sure!

x-Q. 53. I suppose, also, that, if you pressed too hard, and because of the fact that you were holding the stitcher-wheel at an angle to the core, there would be some liability that the stitcher-wheel would slip?

A. Yes, sir.

20 Cross-examination closed.

Deposition closed.

Signature waived.

Recessed until 1:30 o'clock P. M. of the same day.

Resumed, after recess, at 1:30 o'clock P. M. of the same day. Present: as before.

30

TOD J. MELL, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. Tod J. Mell; aged 43 years; Akron, Ohio.

Q. 2. Are you employed by The Firestone Tire & Rubber Company?

40 A. I am.

Tod J. Mell for Defendant—Direct.

Q. 3. What is your position?

A. Technical advisor to the superintendent.

Q. 4. Were you ever connected with The Republic Rubber Company, of Youngstown, Ohio?

A. I was.

Q. 5. When did you start with that concern?

A. August 11, 1905.

Q. 6. How long did you remain with them?

A. 11 years.

10

Q. 7. What was your position there?

A. First, I was manager of the Tire Department; and then as Experimental Engineer.

Q. 8. About how long were you manager of the Tire Department?

A. Five years.

Q. 9. Did they make tires by hand at the Republic Company?

A. They did at first, in the early days.

20

Q. 10. About when did they start to make tires by hand at the Republic Company?

A. Made the first tires in the fall of 1905. Got the department well under way in 1906.

Q. 11. Will you describe how the fabric was put on the core when tires were made by hand at the Republic Company in 1906?

A. The fabric was cut the proper width on the bias, a strip made the proper length to reach round the core of the tire, after being stretched. I should have said at first that the core was cemented, in order that the fabric would stick to the iron. After the ply had been stretched on the core and spliced, it was rolled down, starting at the tread and working down well over the sides. As the fabric was stretched, it tended to lay down to some extent over the sides of the core. The operator, after he had rolled the tread, rotated the core until a sufficient speed was obtained, and then, at first by means of his roller, and later with his stitcher, rolled the fabric on to the core. 40

Tod J. Mell for Defendant—Direct.

1 The motion was then stopped and the tire turned in a
horizontal position; and in this position the operator
finished working the fabric on to the core. The plies
were put on in this manner until sufficient plies under
the bead had been placed; then the bead was placed and
additional plies of fabric stretched, and rolled on to the
tire; after which the tire was trimmed at the bead and
10 the rubber side wall and tread applied. The tire was then
cured in the usual manner that all full-molded tires are
cured in.

 Q. 12. Was the tool to which you have referred as
the "roller" similar to this cylindrical roller, Defend-
ant's Exhibit C?

 A. It was.

 Q. 13. Was the tool which you have referred to as
the "stitcher" similar to this disk-like roller, Defendant's
Exhibit B?

20 A. It was.

 Q. 14. About how much of the fabric on the side was
laid down by the use of the stitcher; I mean how much
in a radial direction?

 A. Probably about half way down the side, which de-
pended somewhat on the skill of the operator, an expert
tire-maker being able to roll it down further than a green
operator.

 Q. 15. When the core was rotating, what position did
30 the edges of the fabric take?

 A. Owing to the centrifugal force, they stood away
from the core to some extent.

 Q. 16. Was this method of building tires which you
have described the regular practice at the Republic Com-
pany in 1906?

 A. It was.

 Q. 17. How did the tire-maker hold the stitcher in his
hands when the core was rotating?

 A. That depended somewhat on the tire-maker him-

Tod J. Mell for Defendant—Cross.

self, different tire-makers holding the stitcher in a slightly different position. Usually, I should say, with the thumb up on the handle; and varying the position accordingly with the surface of the tire he was working on.

Q. 18. Do you know at about what angle, with respect to the plane of the core, he would hold the wheel of the stitcher?

A. That would be very hard for me to say, the operator using his judgment as to the best position. 10

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 19. Was the method you have described the only method used by the Republic Company to make tires?

A. That was the accepted method up until the time a machine was used.

x-Q. 20. Until the time of the adoption of machines, 20 no other method was employed in the Republic plant?

A. Nothing except possibly experimental method or methods.

x-Q. 21. And this same method was used on all sizes of tires?

A. It was.

x-Q. 22. How large tires did you make at that time at the Republic Company?

A. Up to and including 5-inch. 3-inch to 5-inch.

x-Q. 23. You never used the so-called "reciprocating 30 stitching method" to lay down the skirts of the fabric on the core?

A. Just what do you mean by "reciprocating method"?

x-Q. 24. For instance, I call your attention to a sketch, Plaintiff's Exhibit No. 7, which sets forth the sawtooth or serrated path of the stitcher to which I have referred in mentioning the reciprocating method.

A. After the fabric was applied to the core and the tire spun and the operator had worked down with his 40

Tod J. Mell for Defendant—Cross.

stitcher, while the tire was spinning, all the fabric that he could, he stopped the core and used the paddle, and sometimes a stitcher, to stretch the fabric and make it lay smoothly the balance of the space to the inside diameter of the tire. I wouldn't say that he worked it down that way. The path shown in the sketch is at an angle with the radial line of the tire. The method used in 10 stretching the fabric on with a paddle was to stretch very near to radial line; in other words, we worked towards the axis of the tire, instead of at an angle.

x-Q. 25. In other words, you employed a series of reciprocating strokes somewhat like those shown in Plaintiff's Exhibit 7, except that the strokes were not at the angle there indicated; is that correct?

A. It is.

x-Q. 26. And that angle was more acute with reference to the radius than that illustrated in the exhibit? 20

A. Yes.

x-Q. 27. Did you ever make any tires at all at the Republic Company, wherein this reciprocating stitching action was employed to carry the skirts of the fabric all the way down to the bead line?

A. I do not believe that we ever did. All of the tires were rolled down to some extent, varying with the experience of the operator, before the paddle was used.

x-Q. 28. How far down did the operator work on the 30 tire with a cylindrical roller like Defendant's Exhibit C?

A. Somewhat over the crown of the core. This also varied with the operator, some using their rollers further down on the side than others.

x-Q. 29. What percentage of stretch, so far as you can estimate it, was given the fabric in its original circumferential attachment to the core?

A. The stretch was varied considerably. The structure of the fabric made considerable difference. A 40

Tod J. Mell for Defendant—Cross.

closely-woven fabric, for instance, would admit of considerably less stretch than a comparatively loosely-woven fabric; so it is very hard to give any exact, or even approximate, percentage of stretch. Tires were manufactured in an experimental way, some with a very great deal of stretch, the fabric being stretched practically to its limit. Other experimental tires were made with fabric stretched very little. My judgment would be that the stretch used in the earlier days of tire-making varied 10 greatly.

x-Q. 30. I suppose that, in connection with a core of small cross-section, the amount of subsequent side-forming is inversely proportional to the initial circumferential stretch; is that correct?

A. I say yes.

x-Q. 31. For instance, you take a core of small cross-section, say three inches across; and then you stretch the fabric thereon so as to get an 18 or 20 per cent elongation; 20 there is very little additional forming action necessary to apply the fabric to the side of the core; is that correct?

A. Yes, not a great deal of additional forming need be done. However, the fabric had to be applied without wrinkles; and even on a small tire this took considerable care, the fabric never coming down where it lay on the core in its correct position.

x-Q. 32. It has sometimes been the practice, has it not,—you will understand that I am not referring particularly to the Republic Company,—in connection with 30 cores of small size and suitable contour, to rely almost entirely on the circumferential stretching in the formation of the tire on the core?

A. Certain companies, in order to make the operation of applying the fabric easy, stretch their plies to a considerable extent; but even when this is done I would not say that they relied principally upon the stretch, as it was always necessary to place the fabric in its proper position by other means. 40

Tod J. Mell for Defendant—Cross.

x-Q. 33. You have stated that, in the hand-making of tires at the Republic plant, the core was first turned in a vertical position, and then subsequently adjusted to a horizontal position. Tell me what was done when the core was thus placed in a horizontal position.

A. After the fabric was rolled down on the core as much as possible by spinning, the tire was turned on 10 its side, as practically all the tire-makers preferred this position in working the fabric to the bead with the paddle as previously described by me.

x-Q. 34. What was the weight of the fabric, as well as you can remember it, that was used in this hand-making of tires in the Republic plant?

A. Probably very nearly the same weight as is used at present. I know that we changed the construction of the fabric several times. But the weight, I should 20 imagine, remained within an ounce or two above or under that which is at present used, which would be approximately 17-1/4 ounces to the square yard.

x-Q. 35. The observations that you have recorded this afternoon are not based upon your own personal operation of the methods, as I understand it, but rather on what you saw done by employees at the Republic plant?

A. Principally on observation, although I have made a few tires.

x-Q. 36. When was it you left the Republic Company, 30 Mr. Mell?

A. In 1916.

x-Q. 37. And when did you cease your service as manager of the Tire Department there?

A. About 1910 or 1911.

x-Q. 38. And when was it that the method of manufacturing you have already described became the fixed method of the Republic Company?

A. Practically when we started to manufacture tires, 40 as we started with experienced operators.

John W. Thomas for Defendant—Direct.

x-Q. 39. When did the Republic Company give up the method you have been describing?

A. I would say they never gave it up entirely. The operation, to a great extent, is the same now that it ever was.

x-Q. 40. Referring, of course, to hand-made tires?

A. Well, even machine-made tires; with the exception that, after the machine was developed, it wasn't necessary to use the paddle at any time. However, expert operators in the old hand method were able to make tires with very little use of the paddle.

x-Q. 41. When was it, if it is a fair question, that the machines were introduced into the Republic plant?

A. There is no reason that I shouldn't answer, except that I don't know the exact year that we went over on to the machine method. It was about—the machines were in use, I think, before I left the Tire Department. It was right along there sometime. In 1911, probably.

Cross-examination closed.

Deposition closed.

Signature waived.

JOHN W. THOMAS, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

A. John W. Thomas; aged 39 years; Akron, Ohio.

Q. 2. What is your occupation?

A. General Superintendent of The Firestone Tire & Rubber Company.

Q. 3. Is the Firestone Company a large manufacturer of tires?

A. I would say fairly large, not the largest.

John W. Thomas for Defendant—Direct.

Q. 4. You remember the suit of F. A. Seiberling against The Firestone Tire & Rubber Company involving the tire-making machines, which was decided a few months ago by the United States Court of Appeals in Cincinnati?

A. I recall the case.

10 Q. 5. Do you remember a machine that was put in evidence on behalf of the Firestone Company in that case, and which was asserted to embody the construction shown in the Belgian patent to Mathern, No. 194,721, of September 20, 1906?

A. Yes.

Q. 6. Did you ever see that machine operated?

A. Yes.

Q. 7. Whereabouts did you see it operated?

A. At the Firestone plant.

Q. 8. Did you see tires made on it?

A. Yes.

20 Q. 9. Do you know whether tires made on it were put in actual use on automobiles?

A. Yes.

Q. 10. Were they so used?

A. Yes.

Q. 11. What can you say as to whether or not those tires gave good service?

A. We put two of the tires on one of our test-cars. Those two were removed at approximately 1900 miles of
30 service; and then were placed as exhibits in Cincinnati. There were four other tires that were placed on Mr. W. R. Murphy's car, of our Employment Department. A report from Mr. Murphy indicates that those tires gave good service. The exact mileage is not known. He estimates the mileage at about 5,000.

Q. 12. Did this report from Mr. Murphy come to you in the regular course of business as Superintendent of the Firestone plant?

40 A. No, I asked him for it.

John W. Thomas for Defendant—Direct.

Q. 13. Was this report a regular factory report?

A. No.

Q. 14. Will you state whether or not, in your opinion, the tire-making machine referred to was a practical machine for making commercial tires?

A. I would say so. I would say it was.

Q. 15. Will you state whether or not, in your opinion, the tires you saw made on it were commercial tires? 10

A. Yes, they were.

Q. 16. Do you remember a set of photographs which were put in evidence in the Seiberling against Firestone case, relating to this tire machine I have mentioned?

A. I do.

Q. 17. Just look at those photographs I hand you and tell me if they are a duplicate set.

A. In my best judgment, they are.

Q. 18. These photographs have each been numbered, 20 and a descriptive title applied to each, which are the same as the numbers and titles used for the corresponding photographs in the Seiberling-Firestone case. Will you examine these titles and see if they are substantially correct descriptions of the photographs?

A. Yes, they are.

Q. 19. Were you present when these photographs were taken?

A. I was. 30

Q. 20. And are they true photographs of the machine referred to, and of several different stages of the operation of making tires thereon, as described in the titles?

A. In my judgment, they are.

Q. 21. At the present time, the Firestone Company is using tire-making machines with revolving cores and radially-moving spinning rolls?

A. Yes.

Q. 22. Are these spinning-rolls pressed laterally 40

William R. Murphy for Defendant—Direct.

against the core by springs or weights, or by the muscular power of the operator?

A. By hand.

Q. 23. The tire-making machine which I referred to as being put in evidence in the Seiberling against Firestone case has been shipped to The John E. Thropp's Sons Company, at Trenton, New Jersey, the defendant in this
10 present case; is that a fact?

A. Yes.

Mr. Seward: I offer in evidence the set of 18 photographs identified by the witness; and ask that they be marked collectively as Defendant's Exhibit D.

Direct-examination closed.

No cross-examination.

20 Deposition closed.

Signature waived.

WILLIAM R. MURPHY, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

- Q. 1. Please state your name, age, and residence.
30 A. William R. Murphy; aged 29 years; Akron, Ohio.
Q. 2. You are employed by The Firestone Tire & Rubber Company?
A. Yes.
Q. 3. Do you drive an automobile?
A. Yes, sir.
Q. 4. What kind of a car?
A. A Stearns-Knight.
Q. Touring car?
40 A. Yes, sir.

William R. Murphy for Defendant—Direct.

Q. 6. Were four test-tires put on your car here at the Firestone plant last year?

A. Yes, sir.

Q. 7. In what month were they put on?

A. During the month of January.

Q. 8. That's January, 1918?

A. January, 1918, yes, sir.

Q. 9. Have any other test-tires been put on your car since that time?

A. No, sir.

Q. 10. How long did you run those tires on your car?

A. They ran from January to June of 1918, and from December until the present date.

Q. 11. What were you doing between June and December, 1918?

A. I was with the Ordnance Department at Rock Island, Illinois.

Q. 12. And was your car laid up during that period?

A. Yes, sir.

Q. 13. Do you mean to say that all four of the tires are still on your car?

A. One of these tires was scrapped about January 1, 1919; the second tire was scrapped three weeks ago, about April 1, 1919. The remaining two are on the car to-day.

Q. 14. Have you had one of those taken off to-day?

A. One of them taken off to-day.

Q. 15. Is this tire here in the room the one that was taken off to-day?

A. Yes, sir.

Q. 16. Can you state about how far you had driven the tire that was scrapped in January of this year?

A. The one that was scrapped in January probably gave very close to 5,000 miles.

Q. 17. How about the one that was scrapped about April 1st, this year?

Guy L. Evans for Defendant—Direct.

A. It probably ran a little more than 5,000; probably be a difference in there of four or five or six hundred miles.

Q. 18. And about how far have you driven this month?

A. Well, during the month of April I estimate that I drive between five and six hundred miles.

Q. 19. Is this tire which you have just identified still
10 in serviceable condition?

A. Yes, sir.

Mr. Seward: The tire will be marked for identification "Defendant's Exhibit E".

Q. 20. How did the service you received from those four tires compare with the service you received from other tires, on the same car,—in a general way?

A. The service received, I believe, was as good as the average, and better than some.
20

Direct-examination closed.

No cross-examination.

Deposition closed.

Signature waived.

GUY L. EVANS, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes
30 and says as follows:

Q. 1. Please state your name, age, and residence.

A. Guy L. Evans; aged 35 years; Akron, Ohio.

Q. 2. You are employed by The Firestone Tire & Rubber Company?

A. Yes, sir.

Q. 3. Do you remember the so-called "Mathern tire-making machine" that was set up in the basement of the United States Courthouse, in Cincinnati, last year?

40 A. Yes, sir.

Guy L. Evans for Defendant—Direct.

Q. 4. Were you one of the men who operated that machine before the judges of the Court of Appeals?

A. I was.

Q. 5. Did you help make tires on that machine here at the Firestone plant last year?

A. I did.

Q. 6. Did you put any of those tires on the automobile of Mr. William R. Murphy. 10

A. I did.

Q. 7. You saw those put on the car yourself?

A. Yes, sir.

Q. 8. About when was that?

A. Well, shortly before we went to Cincinnati.

Q. 9. You mean before you operated the machine in front of the judges?

A. Yes, sir.

Q. 10. I call your attention to a tire here in the room, 20 which has been marked for identification "Defendant's Exhibit E", and ask you if that looks like one of the tires you put on Mr. Murphy's car?

A. It does.

Q. 11. Did you see any other test-tires put on Mr. Murphy's car at the time stated, except those that were made on the so-called "Mathern" machine?

A. No, sir.

Q. 12. As I understand your testimony, you did not 30 put those tires which were made on the so-called "Mathern" machine on Mr. Murphy's car yourself, but you saw them put on by men; is that correct?

A. Correct.

Q. 13. Now I will ask you, Did you yourself put, or did you see any one else put, any other test-tires on Mr. Murphy's car, at the time stated, except those that were made on the so-called "Mathern" machine?

A. No, sir.

Mark W. Roe for Defendant—Direct.

Q. 14. How many of those tires made on the so-called "Mathern" machine did you see put on Mr. Murphy's car at the time stated?

A. Four.

10 Mr. Seward: The tire marked for identification as Defendant's Exhibit E, and referred to in the testimony of this witness, is offered in evidence as Defendant's Exhibit E.

Direct-examination closed.

No cross-examination.

Deposition closed.

Signature waived.

Adjourned until Friday morning, May 2, 1919, at 9:30 o'clock.

20

Resumed, pursuant to adjournment, Friday, May 2, 1919, at 9:30 o'clock A. M. Present: as before.

MARK W. ROE, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, age, and residence.

80 A. Mark W. Roe; aged 46 years; Youngstown, Ohio.

Q. 2. What is your occupation, Mr. Roe?

A. Mechanical Engineer. At the present time, Consulting Engineer of The Republic Rubber Company, of Youngstown, Ohio.

Q. 3. How long have you been with the Republic Company?

A. Since July, 1917.

Q. 4. Have you been Consulting Engineer during that time?

40 A. I have, sir.

Mark W. Roe for Defendant—Direct.

Q. 5. Is the Republic Company a large tire manufacturing concern?

A. Probably about sixth or seventh in the United States.

Q. 6. Where were you engaged before you went to the Republic Company?

A. Directly previous to going to the Republic Company, I was engineer for the McGraw Tire Company at East Palestine, Ohio, for practically two years. Previous to that I was employed with The Diamond Rubber Company, and its successor, The B. F. Goodrich Company, from April, 1907, until August, 1915. 10

Q. 7. What position did you hold when you went to the Diamond Company in April, 1907?

A. Assistant Engineer.

Q. 8. How long did you hold that position?

A. Approximately three months, when I was made Chief Engineer of the works. 20

Q. 9. Do you know how the tires were made by hand at the Diamond Company in 1907?

A. I do.

Q. 10. Please describe how the fabric was formed on the core at the Diamond Company at that time.

A. The fabric was received by the men cut in bias strips. The ends of these strips were placed upon the core and stretched around the core by the manual power of the operator, after which the core, with the ply of fabric, was revolved by hand, and spinning wheel or stitcher, hand-operated, was used for stitching down the fabric around what would form the bead. 30

Q. 11. Just describe how the spinning or stitching tool was held by the operator, and how it was operated.

A. The core was caused to rotate by the left hand of the operator, spinning tool being held in the right hand, the spinning end of the tool downward, and forced against the tire, usually starting from the center or outside periphery. 40

Mark W. Roe for Defendant—Direct.

phery and working in a spiral line, forcing the fabric to the core, as the spinning tool was advanced, radially toward the center of the core.

Q. 12. Was the core held in a vertical position or horizontal position?

A. Both ways. The earlier stands were usually held in a vertical position.

10 Q. 13. About how fast, if you know, were the cores rotated?

A. It would be hard to say, but I should judge from 50 to 60 revolutions per minute. It would average about that.

Q. 14. Was the stitching or spinning tool to which you have referred anything like this Defendant's Exhibit B?

A. Very much. Practically the same thing.

20 Q. 15. Are you sure this method was followed at the Diamond Company in 1907?

A. Yes.

Q. 16. Do you have tire-making machines at the Republic Company which have power-rotated cores and radially-moving spinning-rolls for forming the fabric on the sides of the core?

A. We do.

Q. 17. How are those spinning-rolls forced laterally against the sides of the core?

30 A. In some by hand lever, and others by foot lever.

Q. 18. Are any springs or weights used for this purpose?

A. No, sir.

Q. 19. At the McGraw Company, when you were there, —that is, 1915 to 1917,—did they have tire-making machines with power-rotated cores and radially-moving spinning-rolls for forming the fabric on the sides of the core?

40 A. They did.

Mark W. Roe for Defendant—Direct.

Q. 20. How were those spinning-rolls forced laterally against the sides of the core?

A. They were forced by hand lever in both cases.

Q. 21. Were springs or weights used for this purpose?

A. No.

Q. 22. Do you know how tires are made at The Knight Tire & Rubber Company, of Canton, Ohio, at the present time?

A. I do. They are made by machine and hand.

Q. 23. Does the machine have power-rotated core and radially-moving spinning-rolls for forming the fabric on the sides of the core?

A. It does.

Q. 24. How are those spinning-rolls pressed laterally¹⁰ against the sides of the core?

A. By hand levers and foot levers.

Q. 25. Are any springs or weights employed for this purpose?

A. No.

Q. 26. Was this also true in 1917?

A. The same condition has existed since my employment with The Republic Rubber Company corporation.

Q. 27. Will you state whether or not, at the McGraw²⁰ Company, in 1915 to 1917, some of the tires were made by hand?

A. They were.

Q. 28. How was the fabric put down on the sides of the core in that operation at that time?

A. Stitched down by hand-stitcher in practically all cases.

Q. 29. Will you just describe that hand stitching so we will understand what you mean?

A. Same operation as described in the Diamond plant.³⁰

Q. 30. Will you answer the last three questions, but substituting the Republic Company for the McGraw Company, and the years 1917 to 1919 for the years 1915 to 1917?

A. I will.

Q. 31. Please answer them.

Mark W. Roe for Defendant--Cross.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 32. Are you sure that your connection with the Diamond Company began in April, 1907?

A. Yes, sir.

x-Q. 33. There is no doubt whatever as to that date?

A. I think not.

x-Q. 34. You think there is no possibility that it might have been later than that, a few months later?

10 A. If my recollection is correct, it was April 1, 1907.

x-Q. 35. Have you endeavored recently to verify that date in any way?

A. No, I have not; had no occasion to.

x-Q. 36. Is it not a fact that, at that time, there was another method of forming the fabric on the sides of the core in use at the Diamond plant?

A. Not that I know of in general use.

20 x-Q. 37. Were not tires made by hand at the Diamond plant, in which the stitcher followed what we term the "sawtooth" path, as indicated, for instance, in the sketch which I now show you, Plaintiff's Exhibit No. 7?

A. So far as I remember, wrinkles or uneven places obtained in stitching a tire were smoothed out by paddle or stitcher along the principle as shown in the "Sawtooth Path Sketch".

x-Q. 38. Was this practice of eradicating wrinkles in this manner frequently followed?

A. Quite frequently.

30 x-Q. 39. And you never saw at the Diamond plant a tire made by hand wherein the skirts were laid down entirely by this sawtooth method?

A. No, I can't say that I have. The paddle or the stitcher was used with wrinkles to lay down at times, but not in the complete operation.

x-Q. 40. Does that statement also hold true in relation to your entire experience at the Diamond plant, or do you mean only at the time you have been discussing, 40 namely, the spring of 1907?

Mark W. Roe for Defendant—Cross.

A. To the best of my knowledge, it was in common use at the Diamond plant,—to stitch them down that way. I mean in common use to stitch them down by the stitcher, by rotating the core.

x-Q. 41. Then, if I understand you correctly, so far as your knowledge goes, no tire was ever made in the Diamond plant by the use of this sawtooth method, but all tires were made by the use of spinning method you have already described? 10

A. No, I don't mean to state it that way. There may have been some tires made this way, according to the sawtooth method, but not to my general knowledge.

x-Q. 42. Have you any idea as to the amount of pressure that was applied to hold the stitcher against the sides of the core in the hand-spinning method?

A. No, I have not.

x-Q. 43. You are unable to estimate it in pounds?

A. That will vary with the pressure the man was able 20 to apply by hand.

x-Q. 44. That is to say, some operators were enabled to press the stitcher against the core with greater force than others?

A. Yes.

x-Q. 45. Would you say generally that the amount of pressure employed in this Diamond spinning process was as great as that now applied in the several machines you have been discussing?

A. Hardly. Not as uniform. 30

x-Q. 46. In other words, you think that the pressure applied at the Diamond plant in the hand-spinning method was not only less than that now applied in the machine, and moreover was not uniform?

A. Yes, sir.

x-Q. 47. Do you think that, in this spiral mode of procedure that you have described, it is desirable to have the pressure on the stitcher uniform?

A. I do. 40

Mark W. Roe for Defendant—Cross.

x-Q. 48. And do you think that it is desirable to have a heavier pressure than was possible in the hand-spinning method?

A. Not necessarily.

x-Q. 49. In other words, you think that the amount of pressure exerted on the stitcher in following the spiral path is more or less immaterial?

10 A. No, it should not be less than a certain amount, nor greater than a certain other amount, the definite limits of which I have not fixed.

x-Q. 50. But undoubtedly a vastly greater amount of pressure can be applied in the machines which you have described than was possible in the Diamond hand-spinning?

A. Yes.

Cross-examination closed.

20 Deposition closed.

Signature waived.

30 Mr. Seward: I request counsel for the plaintiff, to exhibit, some time prior to June 10, 1919, the "Plaintiff's Exhibit No. 2, State Machine," to defendant's experts, for examination, to operate the said machine in building one or more tire carcasses in the presence of the said experts, and to operate the said machine in building one or more tire carcasses at the low and high rotative speeds of the core, named in the specification of the patent in suit, which are, respectively, six revolutions per minute and two hundred and seven revolutions per minute.

I also ask counsel for plaintiff to give me reasonable notice of the time and place for such exhibition and demonstration.

Notarial certificate waived.

40 Adjourned subject to new notice.

Harvey J. Bittaker for Defendant—Direct.

UNITED STATES DISTRICT COURT.

DISTRICT OF NEW JERSEY.

FRANK A. SEIBERLING,
Plaintiff,

v.

THE JOHN E. THROPP'S SONS COM-
PANY,
Defendant.

In Equity.
No. 614.

10

Defendant's Testimony.

Testimony taken in behalf of the defendant, pursuant to notice and agreement of counsel, before Charles J. Carey, a Notary Public within and for Summit County, in the State of Ohio, at the office of said Notary Public, Room No. 726, Second National Building, in the city of Akron, Summit County, Ohio, beginning on Tuesday, June 10, 1919, at 11 o'clock A. M. 20

APPEARANCES:

ROBERT FLETCHER ROGERS, LUTHER E. MORRISON and
CHAUNCEY L. LANDON, Esqs., for the plaintiff;
and

30

E. CLARKSON SEWARD, Esq., for the defendant.

HARVEY J. BITTAKER, a witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. Please state your name, residence and occupation.

A. Harvey J. Bittaker; Akron, Ohio; Assistant Man- 40

Harvey J. Bittaker for Defendant—Direct.

ager of the Cord Tire Department of The Firestone Tire & Rubber Company, Akron, Ohio.

Q. 2. How long have you been with the Firestone Company?

A. Since May 1, 1913.

Q. 3. Where did you work before that?

A. The Diamond Rubber Company, Akron, Ohio.

10 Q. 4. How long were you with the Diamond Company?

A. From December, 1896, to May 1, 1913.

Q. 5. State some of the positions you held there.

A. Inspector in the Bicycle Tire Department, also foreman in the Bicycle Tire Department; inspector and foreman in the construction of automobile tires.

Q. 6. Did the Diamond Company make automobile tires by hand on iron cores?

20 A. Yes, sir.

Q. 7. About what year did they begin that?

A. About the year 1900.

Q. 8. Did they continue that practice for some time thereafter?

A. Yes, sir.

Q. 9. Did you see the tires made on the iron cores?

A. Yes, sir.

30 Q. 10. Please describe how they put the fabric on the iron core at about the time they began to make tires that way, and during the following years.

A. The construction of the tire began by the application of a first ply, which was put on in a band form. The core was then revolved, and the plies were stitched down on the side of the core, additional plies being added that were not put on in the band form were rolled and stitched down in a similar manner.

Q. 11. What kind of a tool was used for the rolling operation to which you have referred?

40 A. There was no roller used on the band ply; but the

Harvey J. Bittaker for Defendant—Direct.

several additional plies were rolled down, that is, on top of the core, with a flat roller, and some with a curvature roller. They were rolled down to a point on the core about half way between the top and the bead line. Then the stitcher was applied, and the balance of the fabric was stitched down with a stitcher about three and a half inches in diameter, and about a one-sixteenth inch face. 10

Q. 12. By the face do you mean the edge?

A. The edge.

Q. 13. Of what material was this stitcher composed?

A. Usually made from round steel material something similar to a line shaft. Steel.

Q. 14. Was it mounted in any kind of a handle?

A. Wooden handle.

Q. 15. When you referred to a straight roller, did you mean a cylindrical shaped roller?

A. Yes. 20

Q. 16. And the curvature roller had a curved face?

A. Yes.

Q. 17. Was this curved face, convex or concave?

A. Concave.

Q. 18. How fast did the man rotate the core while stitching down the fabric?

A. In the early stages of the tire construction, rotating of the core while stitching down the plies was sort of termed as a criminal offense among the employees. 30 Shortly after the tire construction had advanced, it was more common to see the workmen rotate the core at a very high speed while applying the fabric with the stitcher.

Q. 19. About what year was it that it became more common to see this?

A. About the year 1902 or 1903.

Q. 20. While the core was rotating as you have described, what position did the edges of the fabric take?

A. The edges of the fabric were sort of flared out or 40

Harvey J. Bittaker for Defendant—Direct.

spread out on the sides while the core was being rotated.

Q. 21. How did the workman hold the stitcher?

A. By the handle, in whatever angle that was best suited to his own convenience in stitching down the fabric.

Q. 22. About what was the weight of the fabric?

A. Practically the same grade of fabric that is used
10 to-day. I think it was about 17½-ounce.

Q. 23. Do you know Mr. Warren C. Gregg?

A. I do.

Q. 24. Was he working at the Diamond Company when you were there?

A. Yes, sir.

Q. 25. State whether or not you ever saw Mr. Gregg, at the Diamond Company, putting the fabric on a core that was power driven.

A. I did see him applying the fabric.
20

Q. 26. Please describe what you saw him do, including a description of the core.

A. The core, after being placed on the power-driven stand, was cemented; and the construction of the tire proceeded as follows: the first ply of fabric was applied to the core in a band form, which was put on by two men. The band was then centered on the core, so as to be sure that both sides of the fabric would come down to the bead line before the power-driven machine was started in
30 motion. Then the belt was slipped from the loose pulley to the tight pulley, which started the core to rotate. Mr. Gregg then applied the hand-stitcher to the side of the tire, and began to stitch the fabric down to the bead line. After both sides of the band had been fastened to the core in this manner, additional plies were applied in a like manner, until it came time for the application of the beads. After the beads had been applied, additional plies were added to the tire, and stitched down in a
40 similar manner, until a point on the tire was reached that

Harvey J. Bittaker for Defendant—Direct.

contained the bead. Then a grooved stitcher was used in turning the fabric down over the bead, until it reached the toe of the bead. Then the straight stitcher was again applied, and the remainder of the fabric was stitched down to the bead line.

Q. 27. While the core was rotating at the beginning of this stitching operation, what position did the edges of the fabric take?

A. The edges of the fabric were flared out on the sides ¹⁰ similar to the same position that they presented when tire builder was spinning the core by hand.

Q. 28. What was this power-driven apparatus that you have just mentioned?

A. The power-driven apparatus used by Mr. Gregg at this time was a treading stand that is used for applying breaker-strips and treads on tubular tires.

Q. 29. By the breaker-strip do you mean the piece of loosely woven fabric that goes between the tread of the ²⁰ tire and the tire body?

A. I do.

Q. 30. When was it that you saw Mr. Gregg do this work?

A. I do not remember the exact date, but I was married the year 1908. This experiment that Mr. Gregg was trying out took place about two years previous to the above date, that is, the date of my marriage. The reason I say about two years previous is because I remember ³⁰ the date—about the date when the first tire-building machine was installed at The Diamond Rubber Company; and the experiments on the power-driven stand was the first step toward the construction of a tire machine. It took approximately six years for the development of a complete machine by which to build tires at The Diamond Rubber Company. The first machine was installed in the fall of 1911, or the spring of 1912.

Q. 31. About how long was Mr. Gregg working on ⁴⁰

Harvey J. Bittaker for Defendant—Cross.

this belt-driven core, putting on the fabric, at the time you mention?

A. Off and on, about six or eight weeks. He was making demonstrations for several men who were planning construction of the tire machine.

Q. 32. Are you positive that this was prior to 1908?

A. Yes.

10

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 33. You spoke of a stitcher having a concave face. Will you please tell me what you mean by that description.

20 A. By the description of the stitcher with a concave face I mean a stitcher about one-half inch thick, with a groove cut in it about the same shape as the bead, or, in other words, a V shape.

x-Q. 34. You mean there was a groove in the edge of the roller that was V shape in cross-section?

A. Well, yes, I guess you would call it cross-section. I would.

x-Q. 35. And do I understand that it was this form of stitcher that was used to run down the skirts of the fabric on the sides of the core?

30 A. No. This stitcher was used only turning the fabric over the bead.

x-Q. 36. Is your memory pretty good on dates?

A. Well, usually, yes, if not too ancient.

x-Q. 37. Are you sure, for instance, that the Diamond Company used iron cores in the year 1900, which is 19 years ago?

A. Yes.

x-Q. 38. Assuming that other witnesses have testified that iron cores were not used by the Diamond Company
40 until 1903 or 1904, would you say they were wrong?

Harvey J. Bittaker for Defendant—Cross.

A. I would until they presented the proof.

x-Q. 39. Where is Mr. Gregg now?

A. Mr. Gregg is working at the Firestone Tire & Rubber Company, Akron, Ohio.

x-Q. 40. Have you had any recent talks with Mr. Gregg?

A. I have.

x-Q. 41. And did you discuss with him this operation 10 which you have testified to that you saw him employ?

A. I did.

x-Q. 42. What kind of machine did the Diamond Company introduce into operation in 1911 or 1912, concerning which you have already testified?

A. Well, the machine that was introduced in 1911 or 1912 was a two-man machine; in other words, one man working on each side of the core. These men constructed the tire by stitching down the fabric while the core was 20 rotating, by using the stitcher which was controlled by the hands, in about the way the tires had previously been made by hand.

x-Q. 43. At the time you left the Diamond plant, was that machine still in operation there?

A. It was.

x-Q. 44. And do you know whether or not it continued in operation after you left the Diamond plant?

A. After I left The Diamond Rubber Company, I learned through other parties that the machine had been 30—that there had been additions made to the machine, including some of the B. F. Goodrich machines.

x-Q. 45. What was the nature of the additions?

A. I do not know.

x-Q. 46. What features of the Goodrich machine were embodied in it, if you know?

A. I do not know.

x-Q. 47. Do you know whether or not, in the Diamond plant (now a part of the Goodrich Company), the form 40

Harvey J. Bittaker for Defendant—Cross.

of machine you have described is still employed,—I mean a machine provided with a rotating core, in connection with which a man stands on each side of the core to spin the fabric down by hand?

A. I do not.

x-Q. 48. In other words, you have no idea how the skirts or sides of the fabric are formed on the sides of
10 the core in the Diamond machines of to-day?

A. I do not.

x-Q. 49. Do you know how the Goodrich machines are constructed and operated?

A. I do not.

x-Q. 50. Why was the hand-spinning operation at the Diamond plant regarded as a species of criminal offense, as you have stated it?

A. In the beginning of tire construction, it was more
20 theoretical than anything else that the threads of which the fabric was composed could not be kept at a 45-degree angle while being applied to the tire, if stitched down while the core was rotating; but, after the mechanics who were studying the proposition got into it more thoroughly, they found out that applying the fabric while the core was spinning was not detrimental to the tire, as they had previously thought.

x-Q. 51. How were the tire-makers expected to lay
30 down the sides or skirts of the fabric on the core, at this time you have been talking about?

A. Up until the first experiments with construction on a machine, they applied the fabric to the tire with a hand-stitcher, but only moved the core as fast as was deemed necessary to keep the threads at a 45-degree angle.

x-Q. 52. How did the stitcher move, at the time you have just mentioned, in connection with the slowly rotating core?

A. The stitcher rotated slightly while placing the fabric
40 against the sides of the core.

Harvey J. Bittaker for Defendant—Cross.

x-Q. 53. In what direction did the operator move the stitcher, at the time last mentioned?

A. Forward.

x-Q. 54. What do you mean by forward?

A. The core—well, in other words, away from the man.

x-Q. 55. Now, is it not a fact, Mr. Bittaker, that the operator was expected and instructed at this time, in the Diamond plant, to form the sides or skirts of the fabric 10 to the core by a succession of short strokes inward toward the center of the core, and at a slight angle thereto?

A. Yes.

x-Q. 56. In other words, by what is known as the "hand-stitching method", as distinguished from the hand-spinning method?

A. Yes.

x-Q. 57. That is to say, the path of the stitcher in this authorized form was substantially like that shown in the sketch I exhibit to you, and which is marked "Plaintiff's 20 Exhibit No. 7"?

A. Substantially like it, with the exception that the angle may not have been exactly the same.

x-Q. 58. Why did the authorities at the Diamond plant think, at the outset, that the hand-spinning method was detrimental to the tire?

A. Well, I stated previously that it was theoretical that they condemned that practice at first, thinking that the threads which composed the fabric could not be kept at 30 a 45-degree angle.

x-Q. 59. Was that their only reason for condemning the practice at the outset?

A. That is the only reason of which I had ever been taught.

x-Q. 60. You think they based this conclusion on theory, and not on practice?

A. Later demonstrations showed that it was only theory.

Harvey J. Bittaker for Defendant—Cross.

x-Q. 61. Why did the workmen prefer to use the hand-spinning method to the sawtooth method?

A. The fabric could be applied more easily and in less time, naturally.

x-Q. 62. How were the tire-makers paid at that time, —by piece-work, or were they on salary?

A. Piece-work.

10 x-Q. 63. And they found that the hand-spinning method was easier and simpler and quicker; and that, on the piece-work basis, they would make more money? Is that correct?

A. No, that isn't correct.

x-Q. 64. Why is it not correct?

A. Because the men building tires at this time had a piece-work limit, and were allowed to earn a certain amount of money each day.

20 x-Q. 65. And, in earning this maximum amount of money, they found that the hand-spinning method was easier and quicker? Is that correct?

A. Yes, sir.

x-Q. 66. Was that maximum limit ordinarily reached by the workmen in making tires by the sawtooth method?

A. Yes.

x-Q. 67. Then, from the workmen's viewpoint, the hand-spinning method seemed an easier and quicker method of earning their money? Is that correct?

30 A. They considered that the hand spinning was not so laborious. It was easier, but wasn't quicker. Easier on their arm. That was the point.

x-Q. 68. Then you do not think that the hand-spinning method was quicker than the sawtooth method?

A. I do.

x-Q. 69. Then it was quicker as well as easier?

A. Yes, it was quicker as well as easier.

x-Q. 70. Then your answer to x-Q. 67, wherein you say, "It was easier, but wasn't quicker", was a mistake,
40 was it?

Harvey J. Bittaker for Defendant—Cross.

A. Well, it wasn't exactly a mistake: it was simply wanting to bring out my point to show that the workmen would not be benefited from a financial standpoint by the hand spinning.

x-Q. 71. But you agree now that it was both easier and quicker, whatever you may have meant in your answer to x-Q. 67?

A. I do.

x-Q. 72. Coming back to the Gregg matter, I should like to ask you again why it is that you fix the date as you have done? ¹⁰

A. In fixing the date, it was in reply to Mr. Seward's question.

x-Q. 73. Very well, then; I shall change the form of the question. How do you fix the date of the Gregg matter as you have done?

A. As stated previously about being married in 1908, and stating that it was about 1905 or 1906 when Mr. Gregg was experimenting on this work, I will state that a new building was under construction at the time of Mr. Gregg's experiment, and was not completed for about three years later, which was the year in which I was married.

x-Q. 74. And how long was that building under construction?

A. I believe that, from the time they started to move the houses away from Jackson Street until the completion of the building, was about three years. Mr. Gregg was experimenting on this power-driven machine at the time they started to move the houses from Jackson Street, and it was then contemplated that this building was to be equipped with tire-making machinery such as could be developed from experiments made by Mr. Gregg and several mechanics. ³⁰

x-Q. 75. And, when the building was completed, was it equipped with machines of this kind?

A. It was not equipped with machines until about 40

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Harvey J. Bittaker for Defendant—Cross.

three years later, three years after the building was completed.

x-Q. 76. When were you married, Mr. Bittaker?

A. 1908.

x-Q. 77. Would you give me the exact date, please?

A. September 15th.

10 x-Q. 78. Then Mr. Gregg performed his experiments about three years previous to your marriage; is that correct?

A. No. Mr. Gregg performed the experiments about five or six years previous to my marriage.

x-Q. 79. Do you know when Mr. Gregg says he performed the experiments?

A. I do not.

x-Q. 80. It is rather difficult, is it not, trying to fix precise dates like this, after a period of fifteen years or so?

20 A. Not if you have recollections of certain happenings that occurred to freshen your memory.

x-Q. 81. And that is the reason you have been able to testify with such positiveness as to the date when Mr. Gregg performed his experiments?

A. Yes, sir.

30 x-Q. 82. I call your attention to the fact that you have already given three different dates for Mr. Gregg's experiment. You first said it was in the year 1906. You then said that it was in 1905 or 1906. And you last said that it was five or six years previous to your marriage, which would make it in 1902 or 1903. Now, will you tell me which of these assorted dates is the correct one?

A. About 1905.

x-Q. 83. Your statement that it was five or six years before your marriage was incorrect, was it?

A. I don't believe I made that statement.

40 x-Q. 84. I call your attention to x-Q. 78, and your answer thereto. Do you now believe that you made the

Harvey J. Bittaker for Defendant—Cross.

statement that Mr. Gregg performed his experiments five or six years before you were married?

A. I don't believe it now. If I did, I meant that it was five or six years from the time Mr. Gregg made his experiments until the first tire machines were installed in the new building of which I speak; and that was the year 1911 or early in 1912.

x-Q. 85. You say you don't believe it now. Do you think the Examiner made a mistake in transcribing your answer? 10

A. The transcriber either made a mistake, or I misunderstood the question from the examiner.

x-Q. 86. Well, which do you think is the correct explanation?

A. I think the correct explanation is the last one that I have made, regarding Mr. Gregg's experiments.

x-Q. 87. I ask you again whether you think the Examiner (Mr. Carey) made a mistake or you misunderstood the question? 20

A. It's possible that I misunderstood the question.

x-Q. 88. Do you know when Mr. Gregg left the employ of the Diamond Company?

A. I do not.

x-Q. 89. Do you remember whether it was before or after you were married?

A. It was after I was married.

x-Q. 90. Mr. Gregg says it was in 1907. Do you think he was wrong? 30

A. He ought to know better than me, but I am positive that Mr. Gregg was working in the new building which I spoke about previously.

x-Q. 91. And that building was completed about the time of your marriage?

A. Building was completed in the fall of 1908.

x-Q. 92. And you remember distinctly that Mr. Gregg was working in that new building that was not completed until the fall of 1908? 40

Harvey J. Bittaker for Defendant—Cross.

A. I would not condemn Mr. Gregg's own date, but it seems to me that Mr. Gregg worked in this building. He might have left the employ of the Company in 1907, as he states, and returned at a later date, as is often the case.

x-Q. 93. You think, then, that is the explanation,—that he left the Diamond Company in 1907, and came back to it and afterwards worked in the new building?

A. I do.

10 x-Q. 94. Did he resume his experiments on the power-driven core when he returned the second time to the Company?

A. Not to my knowledge.

x-Q. 95. And you are certain that the experiments he conducted were in the old building, and not in the new one?

A. I am.

x-Q. 96. When Mr. Gregg finished his experiments, what did he do then?

20 A. He either went back to building tires, as he had previously done, or went on inspecting.

x-Q. 97. You don't remember which?

A. I believe he went on inspecting.

x-Q. 98. But you are not sure of it?

A. No.

x-Q. 99. Do you remember how soon it was Mr. Gregg came back into the employ of the Diamond Company the second time?

30 A. I do not. I don't know whether there was a second time.

x-Q. 100. But you saw him at work in the new building that was not completed until 1908?

A. I did.

x-Q. 101. Then, if he left in 1907, he must have come back?

A. I have no knowledge of him leaving in 1907.

Cross-examination closed.

Deposition closed.

Harry K. Raymond for Defendant—Direct.

HARRY K. RAYMOND, the next witness called on behalf of the defendant, being first duly sworn, in answer to interrogatories propounded to him by Mr. Seward, deposes and says as follows:

Q. 1. What is your name, residence, and occupation?

A. H. K. Raymond; Akron, Ohio; Second Vice-President, in charge of production, of the B. F. Goodrich Company, Akron, Ohio. 10

Q. 2. Did you at one time have charge of the tire manufacturing department of the Goodrich Company?

A. I did.

Q. 3. During what period, about?

A. About between 1900 and 1910.

Q. 4. I show you a copy of U. S. Patent to A. E. Vincent, No. 794,473, dated July 11, 1905. Do you recognize the machine shown in that patent?

A. I do. 20

Q. 5. Will you state whether or not the Goodrich Company ever had a machine like that?

A. They did.

Q. 6. When was that machine received by the Goodrich Company?

A. In about December, 1906.

Q. 7. Was it used after it was received?

A. It was.

Q. 8. About how long was it used?

A. I should say possibly eight months, possibly a 30 year.

Q. 9. About when was it first used?

A. About February, 1907.

Q. 10. About how many tires were made on it by the Goodrich Company during the year 1907?

A. Between seventeen and eighteen thousand.

Q. 11. State whether or not those were commercial tires.

A. They were. 40

Harry K. Raymond for Defendant—Cross.

Q. 12. Will you state whether or not there was any arrangement whereby a royalty was paid to Mr. Vincent on those tires?

A. There was.

Q. 13. Were the royalties paid?

A. They were.

Q. 14. And those tires were sold, were they?

10 A. They were.

Mr. Seward: The Vincent patent shown to the witness will be offered in evidence in connection with the testimony of Mr. Frank N. Waterman, who will be defendant's expert.

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

20 x-Q. 15. Do you know of any similar Vincent machines now in use, Mr. Raymond?

A. At the present time? I do not.

x-Q. 16. Did the machine operate satisfactorily with you?

A. It did.

x-Q. 17. Entirely satisfactorily?

A. At that period of time, yes.

x-Q. 18. You mean the tire standard was not, perhaps, quite so exacting then as later on?

30 A. Not at all that. I mean that machine was at that period a perfectly satisfactory machine. It was developed to produce more tires, at a less cost.

x-Q. 19. Were the tires of as good quality?

A. They were.

x-Q. 20. Did you have any difficulty in the cam mechanism that operated the hammers, that you recall?

A. No material difficulty, no.

x-Q. 21. But there were some imperfections in that
40 action, were there not?

Harry K. Raymond for Defendant—Cross.

A. I shouldn't say so. I don't think there was anything mechanical that couldn't have been cared for.

x-Q. 22. Were the original stretching devices for the fabric satisfactory in their mode of operation, as you recall it?

A. I think so. They made perfectly good tires.

x-Q. 23. How about the devices for placing the clincher beads? Do you recall whether or not they were satisfactory?

10

A. They served the purpose at the time the machine was in operation. Improvements, of course, have been made in that, and other parts of the art, since then.

x-Q. 24. Was it a single machine or double machine?

A. Double machine.

x-Q. 25. Let's see, part of the work was done on one machine, and the remainder of it on another?

A. Quite correct.

x-Q. 26. And, briefly speaking, how was the work divided between these two machines? Tell me very briefly. How much was done on one, and how much on the other?

20

A. The first section embraced the means for stretching the fabric and putting it on the core in superimposed plies; and also was provided with a series of little hammers which beat upon the sides of the plies thus stretched on the core and patted and attached them to the core and to each other. The other part of the machine was provided with devices for attaching and forming the canvas around the bead, and facilities provided for trimming.

30

x-Q. 27. As I understand it, this Vincent machine system was superseded by the present Goodrich machines?

A. It was.

x-Q. 28. Why did you make the change, Mr. Raymond, from Vincent machines to the present style?

A. In the natural line of progression.

x-Q. 29. In other words, the Goodrich machine is a better machine than the Vincent machine?

40

Harry K. Raymond for Defendant—Cross.

A. A more productive; faster productive machine.

x-Q. 30. More economical?

A. More economical of operation.

x-Q. 31. Could you tell me what percentage of stretch you secured in the original Vincent machine? I am talking now of circumferential stretch?

A. I should say was approximately the same as is now the common practice.

x-Q. 32. About how much would that be?

A. Well, about 18 per cent.

10 x-Q. 33. In other words, on this Vincent machine the fabric was pretty well stretched down over the sides of the core?

A. It was.

x-Q. 34. And, of course, to that extent the amount of side-forming was correspondingly reduced?

A. I think, Mr. Rogers, that the amount of stretch and the shape of the fabric on the Vincent machine con-
formed very closely to what is considered good practice
20 to-day.

x-Q. 35. The only thing I am particularly after is the amount of stretch.

A. That is about 18 per cent, which gives the contour of the fabric.

x-Q. 36. Of course, some companies don't use that much, and others use more?

A. I believe it is the current practice to vary the amount of stretch according to the size of the tire in
30 relation to its diameter. You must of necessity suppose the diameter for a given stretch.

x-Q. 37. Was there any liability to the formation of air-pockets in the Vincent practice?

A. I don't believe so. Not to my recollection.

Cross-examination closed.

Deposition closed.

Signature waived.

Notarial Certificate waived.

William W. Duncan for Defendant—Direct.

UNITED STATES DISTRICT COURT

DISTRICT OF NEW JERSEY

FRANK A. SEIBERLING

Plaintiff

v.

THE JOHN E. THROPP'S SONS CO.
Defendant.

In Equity.
No. 614.

10

Defendant's Testimony.

Testimony taken in behalf of defendant, pursuant to notice and agreement of counsel, before C. B. F. DAVIS, Notary Public in and for the County of Middlesex, State of Massachusetts; at the plant of the Hood Tire Company, Watertown, Mass., on Thursday, June 5, 1919, ²⁰ beginning at eleven A. M.

APPEARANCES:

For plaintiff: ROBERT FLETCHER ROGERS, Esq. and
LUTHER E. MORRISON, Esq.

For defendant: E. CLARKSON SEWARD, Esq.

WILLIAM W. DUNCAN, being duly sworn, deposes and testifies as follows; in response to questions from Mr. 30 Seward.

Q. 1. Please state your name, residence and occupation.

A. William W. Duncan, Watertown, Mass.; president, Hood Tire Company.

Q. 2. How long have you been connected with the tire business?

A. Since 1906.

Q. 3. How long with the Hood Tire Co.?

40

William W. Duncan for Defendant—Direct.

A. The Hood Tire Co. was formed as a selling Company for the Hood Rubber Co. in 1914. Prior to that time I was with the Hood Rubber Co. from 1905.

Q. 4. Was the Hood Rubber Co. making automobile tires by hand in 1905 and 1906 and 1907?

A. They started making tires in the spring of 1906.

Q. 5. And continued making tires in 1907?

10 A. Tires were made continuously from 1906 until 1911 by hand.

Q. 6. Please describe how the fabric was placed on the core in making tires by hand at the Hood Rubber Co. in 1906 and 1907.

A. The core was mounted upon what was termed the spider, this spider consisting of a hub with three radial arms. Upon one of the arms was attached a handle for the purpose of rotating the spider and core. The hub
20 was bored to fit upon a projection of the supporting arm upon which it would revolve. This supporting arm was curved in such a way as to miss hitting the core by about four to six inches, and then curved back into the line of the plane of the core, continuing in this line over the top of a bench. It was held on the top of the bench by two clamps one of which contained a set screw, so that the core and spider could be held either in a vertical or a horizontal position, or any position between, by clamping or unclamping the set screw. For applying the fabric
30 to the core, the core was placed in vertical position; a piece of fabric was furnished the operator of proper width to cover the core from side to side and approximately twelve percent less in length than the circumferential measure of the top of the core. I have omitted to mention that on the hub of the spider was a pawl attachment whereby the pawl engaging with the hub could hold the core fixed in one position. The operator took one
40 end of the fabric in his hands, throwing the balance of length over his shoulder. He cemented a small spot on

William W. Duncan for Defendant—Direct.

the top of the core and attached the end of the fabric to this spot. He then stretched the fabric from that spot onto about eighteen inches of core circumference. Then moved the position of the core so that the point of contact with the fabric was again at the top position, setting the pawl to hold it again in that position, and again stretched the fabric another twelve to eighteen inches of the circumference. He continued the stretch- 10 ing operation until the piece of fabric covered the entire circumference at the top of the core section, and lapped the end of the fabric about one inch over his starting point. This left the core with an endless piece of fabric covering its outer circumference and because the fabric was shorter than the outer circumference of the core, made it conform to the cross section contour down to a point between one and one and three-quarter inches from the center line of circumference. This amount would 20 vary with the size of the core; on a three inch core it would contact about one inch from the center line of circumference; on a four and a half inch core it would contact around one and three quarter inches. But the point of contact on the side would always end at approximately the same percentage height above the cutting line of the core. By the cutting line I mean the point at the so-called toe of the bead where the tongue of the core attaches. It is approximately the point at which the toe of the bead is trimmed for removing excess width 30 of fabric.

At the edge or end of the point of contact of fabric on the shoulder of the core, the remaining width of the ply stood out at approximately right angles to the core, because that was the length to which the fabric was cut before application. It was then necessary to apply these skirts of fabric as we called them to contact with the remainder of the core as far down as the cutting line. This was done with what was called a stitching or spin- 40

William W. Duncan for Defendant—Direct.

ning roll, which was simply an enlarged cake or pie crust cutter with a larger wheel. The ordinary size of spinning wheel ran from one and a half to two and a half inches, and the edge went down to a sharp cutting edge just blunted over by spinning against an oil stone. This was a metal roll or wheel. The wheel was held between two supports in the shape of a yoke and a wooden handle attached. The ordinary method of operation for using
10 this roll or spinning tool on the fabric and core for applying was to unclamp the set screw on the bench and turn the core and spider from a vertical to approximately a forty-five degree position, then to clamp the supporting arm so as to hold the core and spider in that position. The pawl was then released from the hub so that the core and spider could revolve on the support, and with the handle previously mentioned as attached to one of the arms of the spider, the core was revolved rapidly. Be-
20 cause of its weight, approximately one hundred and fifty to two hundred and fifty pounds, it would maintain its speed of revolution for some considerable time. While it was revolving the operator would take the spinning tool in his hand and apply it to the revolving core and fabric at the end of the point of contact caused by the stretching, allowing it to revolve against the fabric and core with manual pressure applied. He would then gradually move it down, as the core and fabric revolved, in a radial line, towards the cutting point of the core, until the
30 fabric was completely applied to the entire surface of the core on one side. The operator would then shift the position of his core and spider to approximately forty-five degrees on the opposite side of the vertical position and with his spinning tool apply the opposite side or skirt of the fabric in the same manner. While it was ordinary practice to spin down one side at a time, I have seen workmen spin it in a vertical position using a roller in each hand to save time. But as I say, it was not ordinary
40 because very tiring.

William W. Duncan for Defendant—Direct.

The following plies of fabric were applied in the same way until the proper thickness of tire carcass was built up.

Q. 7. When you say the workmen would occasionally use a roller in each hand, do you mean that they would lay down both sides of the fabric at the same time?

A. Yes.

Q. 8. Are you positive that this operation you have 10 described was followed at the Hood Co. prior to 1908?

A. The method as described above of putting down one side at a time was used from 1906, by all our operators. The use of a roll in each hand was not at all ordinary. It was too hard on the men to use the two rollers throughout a days work.

Q. 9. What position did you hold in the Hood Rubber Co. in 1906 and 1907?

A. At that time I was manager of the experimental 20 department, which made out all construction and operating orders for mill methods.

Q. 10. By the expression "mill methods" do you mean the methods followed in manufacturing the tires?

A. Yes.

Q. 11. Did you yourself see these tires made by the spinning method you have described in 1906 and 1907?

A. I not only saw it, but did it myself.

Q. 12. While the core with the fabric on it was rotating, as you have described, what position did the edges 30 of the fabric take or maintain?

A. The fabric stood out at approximately right angles to the plane of the core. The roller was applied to the fabric on the core at approximately an angle of forty-five degrees to the plane of the core. As the operator moved the roller radially towards the cutting line the fabric moved from a position of right angles down towards the cutting line of the core to a position horizontal with the plane of the core and finally beyond that position to a 40

William W. Duncan for Defendant—Cross.

position approximately ten per cent the opposite side of the plane of the core.

Q. 13. Do you remember the suit of Seiberling v. Firestone involving a tire making machine?

A. Yes.

Q. 14. Did the Hood Co. sell to the Firestone Co. a tire making machine for that suit?

A. Yes.

10 Q. 15. Please state what that machine was?

A. It was the first original machine which the Hood Co. purchased from Mr. Mathern, installed the latter part of 1911, and in operation from then until the time of sale to the Firestone Co.

Q. 16. Did you know Mr. Mathern?

A. Yes.

Q. 17. Did you work with him or he with you?

A. He was in our plant installing the first machine
20 approximately a month. On a later visit he was with us approximately ten days.

Q. 18. Can you tell us what sort of man he was?

A. He was a well educated, technically trained inventor and designer, with a very thorough knowledge of European tire making practice.

Q. 19. Are you an engineer, Mr. Duncan?

A. I hold the degree of Bachelor of Chemistry from Massachusetts Institute of Technology. The Chemical
30 Course included the engineering practice embodied now in the course on Chemical Engineering.

Q. 20. And you are a graduate of Yale?

A. I am also a graduate of Yale.

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 21. How do you fix the dates that you have given, Mr. Duncan, by memory alone?

40 A. We started the tire business with the Hood

William W. Duncan for Defendant—Cross.

Rubber Co. approximately nine months after our experimental department was moved from Boston to the factory, which was on June 1, 1905. That is the date I find on the payroll cards of the Hood Rubber Co. That is to say, we started the manufacture of tires I referred to in April or the Spring of 1906.

x-Q. 22. In this suit of Seiberling v. Firestone, you executed one or more affidavits, did you not?

A. Yes.

10

x-Q. 23. And when did you last see or read over those affidavits or a copy of one or more of them?

A. This morning.

x-Q. 24. And did you refer at any time during your direct examination to that copy of affidavit?

A. I referred for dates.

x-Q. 25. Is the paper lying before you on the table that affidavit or a copy of it?

A. It is a copy of it.

x-Q. 26. I understand that in this hand spinning operation that you have described the amount of circumferential stretch was twelve per cent. Is that correct?

20

A. We have made tires with stretch from eight to twenty-four. I used twelve because it is about as much as the ordinary hand worker will pull. This might vary on an actual hand made tire as high as seventeen percent.

x-Q. 27. What did you say was the average stretch employed in connection with hand made tires such as you have already referred to?

30

A. This will vary with different companies. We preferred to get seventeen.

x-Q. 28. Why did you prefer to get seventeen percent of stretch?

A. Because that brought what we called the neutral line of fabric to the best position on the side of the tire which could be obtained with manual stretching.

x-Q. 29. Why did you call this position the "best" position?

40

William W. Duncan for Defendant—Cross.

A. When the fabric is cut to a length and width for application to the core, it is cut on the bias, and the warp and filler lines are at forty-five degrees angles to the length of the strip, or a ninety degree angle to each other.

In order to apply such a flat strip to the entire surface of the core, it is necessary to make the length of the strip at about a medium circumference of the core.

As it is stretched on at the top of the core, the warp
10 and filler yarns naturally change from a ninety degree angle to each other to a smaller angle relative to the top circumference of the core. As the fabric is applied down over the side of the core toward the smaller circumference at the cutting line, there comes a point on the side of the core where the warp and filler lines are at again a ninety degree angle to each other. From that point to the cutting line, the angle is again changed to a greater
20 than ninety degree difference relative to the circumferential line. The road service shows that the nearer this neutral line, or the point at which the warp and filler threads remain at a ninety degree angle, is to the bead seat position of the rim on the tire, the better the tire will run. A seventeen per cent stretch brought this line down toward the cutting line of the core about as far as could be obtained by manual stretching.

x-Q. 30. I suppose also that the further you stretched the fabric down onto the core, by the original circumferential stretching, the less was the amount necessary
30 to be formed down to the cutting line by hand. Is that correct?

A. That would naturally have to follow.

x-Q. 31. After the spinning operation that you have described, was there any further manipulation of the ply before you superposed the next ply?

A. Nothing except to trim off the excess fabric extending beyond the cutting line and placing the core back again in a vertical position for the start of the next ply
40 application.

William W. Duncan for Defendant—Cross.

x-Q. 32. Were these hand made tires straight side or clinchers?

A. They were in 1906 at least clincher and quick-detachable clincher. In 1907 we manufacture the Dunlop type of straight side.

x-Q. 33. I understand from your testimony that the method of hand spinning you have described was the only method employed in the hand making of tires by the Hood Co. Is that correct?

A. That was the way we told all our operators.

x-Q. 34. Was any other method ever used by the Hood Co. in making the tires by hand.

A. Not to my knowledge.

x-Q. 35. You are familiar with the so-called saw-tooth method of stretching tires are you not? As illustrated for instance in the sketch I am showing you which is Plaintiff's Exhibit No. 7.

A. Do you mean the movement of the stitching and spinning tool back and forth or do you mean the shoving of what is called a spade tool right down to the end? 20

x-Q. 36. I should like to get your knowledge as to either or both of the methods you mention.

A. The only time that a saw-tooth movement of a stitcher or a spading tool need be used is when a wrinkle develops in the application by the spinning roll in the hand spinning which necessitates lifting the fabric from the core and straightening out the wrinkle. With a skilled operator who did not move his spinning tool too rapidly toward the cutting line in the radial line of the core, the necessity for the use of a saw-tooth movement or the spade for straightening out a wrinkle never developed. If the operator moved the tool too rapidly, he might develop one or two wrinkles which would be removed by the saw-tooth or the spade. 30

x-Q. 37. And when such a wrinkle or defect as you describe occurred, it was the Hood practice to remove 40

William W. Duncan for Defendant—Cross.

the defect or wrinkle by the use of the tool in the manner referred to by you in your last answer. Is that correct?

A. In such cases, which were very seldom, we always used the spade, in substantially a radial direction at the place where the wrinkle occurred to eradicate it.

10 x-Q. 38. Did it ever happen that the initial momentum given the core in rotating it was not sufficient to keep the core rotating until the spinning operation was complete?

A. It may have. If it did, it was started again.

x-Q. 39. And when it was started again, did the operator begin the spinning operation at the point where he left off before, or did he begin the spinning operation all over again?

A. He would begin a little above his finishing point.

20 x-Q. 40. You say that you practiced this hand spinning method yourself on occasion?

A. Yes.

x-Q. 41. Are you able to say what amount of pressure you employed to hold the stitcher against the core?

A. In determining the amount necessary to apply on machine rollers, we found that tests on the hand pressure as near as we could develop amounted to about a one hundred pound spring.

30 x-Q. 42. And that pressure was normally exerted by the workman in spinning down the side of the fabric on the core in the hand spinning operation?

A. I should say that it would vary from twenty-five to a hundred and fifty pounds according to how tired the man was.

x-Q. 43. In other words, the workman after a hard day's work, would be unable to exert the same amount of pressure on the side of the core as in the morning when he was fresh. Is that the idea?

A. It seems very probable.

40 x-Q. 44. And you think that the pressure would vary

William W. Duncan for Defendant—Cross.

according to circumstance from twenty-five to one hundred and fifty pounds?

A. That would be my idea.

x-Q. 45. How many tires a day would a man make by the hand spinning method you have described?

A. Where a man made a complete tire, outside covering and all, he would make from three to four small ones and from a half to one large one. When a man only applied the plies, I have never seen over eighteen small ones or five large ones, as a high record. 10

x-Q. 46. And ignoring the high record, what would be the average production of the workman where he laid down the plies without finishing the tire?

A. About twelve small ones and four large ones.

x-Q. 47. And you say that at the end of the day, he would be pretty thoroughly fatigued,—“all in”, I think was the expression you used.

A. He would be tired, yes. I can answer that from personal experience. 20

x-Q. 48. Was there any tendency of the hand held roller to slip when on the side of the core, when great pressure was applied to it?

A. Not when a spinning wheel of about two and a half inches diameter was used. A small wheel would have a tendency to let the skirt of fabric catch the supporting yoke and jerk it out of position.

x-Q. 49. What size spinning wheels were ordinarily used by the Hood Co. in the hand spinning method? 30

A. The first wheels were about an inch in diameter but were almost immediately increased from two to two and a half inches.

x-Q. 50. And the smaller ones were abandoned?

A. The smaller ones were abandoned.

x-Q. 51. How did the operator hold the tool, I mean the spinning roll, during the hand spinning operation.

A. He held it out at the end of his arm, with the arm 40

William W. Duncan for Defendant—Cross.

crooked and with the roll at about a forty-five degree angle to the plane of the core, and then moved the roll radially inward.

x-Q. 52. Was that the only method employed by the Hood workmen of holding the hand spinning tool,—I mean the one described by you in your last answer.

10 A. That was the method taught the operator. Sometimes a light man would put his other hand on top of the hand holding the tool.

x-Q. 53. Then I understand you to say that with the tool held away from the body and with the arm crooked, the operator could continuously exert, or at any rate exert for some time, a pressure of one hundred and fifty pounds on the side of the core? Is that correct?

A. No, that would be the high pressure. It would vary from that down to about twenty-five pounds.

20 x-Q. 54. In other words, when he started fresh in the morning, he would be exerting a pressure of 150 pounds but by night the pressure might diminish to 25 pounds. Is that the idea?

A. That would vary with the man. He might exert the greatest pressure in the middle of the day.

x-Q. 55. Would you say that in two successive operations, the first on one side of the core, and the second on the other side of the core, that the amount of pressure would be uniform?

30 A. I should say very unlikely, but it is immaterial, providing the fabric is applied smoothly.

x-Q. 56. In other words, do you regard the amount of pressure on the core as immaterial, so long as the fabric is applied thereby smoothly to the core?

A. Yes. The important thing is the stretch.

x-Q. 57. You mean radial stretch, do you not by your last reference to the stretch?

A. I mean circumferential stretch because that governs radial stretch.

40

William W. Duncan for Defendant—Cross.

x-Q. 58. Then if I understand you correctly, you regard the circumferential stretch applied initially as the important thing, and the amount of side pressure subsequently applied as relatively unimportant.

A. Yes, the amount of side pressure need be only sufficient to apply the fabric smoothly. The adhesion is obtained during the molding operation.

x-Q. 59. What was the weight of fabric used in making tires by this hand spinning operation? 10

A. It was seventeen and a quarter ounce standard Hood tire fabric, approximately twenty-three threads to the inch in each direction, of 23/11 yarn.

x-Q. 60. In other words you then used about the same kind of fabric that you now use?

A. The specifications were practically identical.

x-Q. 61. How long did this hand spinning operation continue in use in the Hood plant? 20

A. Until the installation of the Mathern machines in 1911 and 1912, and up to the present time on the five and a half inch tires, which was discontinued in the summer of 1918 by the War Industry Board.

x-Q. 62. Was there any difference in product due to the personal equation of the workman or because of his possible vagaries or lack of attention, or anything of that sort?

A. We did not notice any. We had a good inspection system. 30

x-Q. 63. Now Mr. Duncan, I understand that when you adopted the Mathern machine in the year 1910 and 1911, that Mathern machine was not provided with a tool like that illustrated in Fig. 6 of the Mathern-Belgian patent.

A. No.

x-Q. 64. But the Mathern machine was provided with the means shown and described in the Mathern German 40

William W. Duncan for Defendant—Cross.

patent for laying down the skirts upon the inwardly turned sides of the core. Is that correct?

A. Referring to the Mathern German patent, it had the spinning rollers shown in Fig. 1, at 29.

x-Q. 65. And it also had the pair of reciprocating rollers 30 shown both in his Belgian and German patents?

10 A. It had a single pair of such rollers for the smaller machines, I mean for the smaller cores, while additional pairs of similar rollers were provided for use with the larger cores for the manufacture of the larger size tires.

x-Q. 66. Please tell me how the pairs of reciprocating rollers 30 last referred to operated on the fabric already stretched on the core?

A. They were used to apply the fabric down to the neutral line of the fabric, approximately the center of the
20 side of the core.

x-Q. 67. And after that, the stepped rolls 29 of the German patent were employed to attach the skirts of the fabric for the remainder of the distance to the bead. Is that correct?

A. That is true. We had the rollers shown in the Belgian patent discarded from the machine, because that necessitated putting on each ply separately and then screwing down the carriage holding the yoke and a pair
30 of rollers. By the use of the series of stepped rollers we were able to make the carcass in one complete operation without cutting at each ply, which insured absolutely uniform stretch. The machine was offered to us with either device but this latter looked better to us from a standpoint of uniform stretch and speed.

x-Q. 68. Then I understand that in the use of these Mathern machines you also relied upon a considerable percentage of circumferential stretch. Is that correct?

A. Yes, we run from seventeen to twenty-four percent
40 depending upon the size of the tire.

William W. Duncan for Defendant—Cross.

x-Q. 69. And in that way you succeed in getting the line of attachment of the ply to the core further down than if you used a smaller percentage of stretch.

A. Yes, it goes nearer the cutting line.

x-Q. 70. And that in turn, as you have already indicated, proportionately reduces the amount of side forming of the unattached skirt. Is that correct?

A. A very slight amount.

10

x-Q. 71. And I understand also that in these Mathern machines your main idea is to attach the skirts of the fabric to the sides of the core smoothly, rather than with the intention of stretching them radially. Is that correct?

A. Partially. We aim to apply it smoothly with a proper angle of the warp and filler yarns to each other.

x-Q. 72. And you still use the set of side forming rolls for instance as shown at 29 in Fig 1 of the Mathern 20 German patent.

A. Yes.

x-Q. 73. And those rolls move in a circumferential path without radial component?

A. We use some moving in a circumferential path and some stationary. It seems to be immaterial. Each pair of rolls takes the place of a radial movement of a single pair of rolls.

x-Q. 74. But none of the rolls that you now use move 30 in a radial direction?

A. Not during the revolution of the core. They are moved radially for different sized cores and a radial movement is unnecessary because each pair of rolls takes care of the next successive step down of the radial movement.

x-Q. 75. In other words, the radial movement you refer to is one availed of only when you change the size of the core.

A. Yes.

40

William W. Duncan for Defendant—Cross.

x-Q. 76. And there is no radial movement of any of the rolls during the actual formation of the sides of the tire?

A. There is no radial movement of the rolls. There is radial movement of the fabric, due to the application position of the rolls.

x-Q. 77. Then the stretching effect, if there be any, is due to the oblique setting of the radially stationary roll, and not to any radial movement of the roll itself?

A. That is correct.

Cross-examination closed.

REDIRECT-EXAMINATION :

Rd-Q. 78. What position do you hold at present in the Hood Rubber Co., in addition to your position as president of the Hood Tire Co.?

20 A. I am manager of the tire department of the Hood Rubber Co.

Deposition closed.

Signature waived.

Notarial certificate waived.

Paul J. Salvatore for Defendant—Direct.

UNITED STATES DISTRICT COURT

DISTRICT OF NEW JERSEY

<p>FRANK A. SEIBERLING, Plaintiff,</p> <p>AGAINST</p> <p>THE JOHN E. THROPP'S SONS COMPANY, Defendant.</p>	}	<p>In Equity No. 614</p>	<p>10</p>
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Defendant's Testimony.

Testimony taken in behalf of defendant, pursuant to notice and agreement of counsel, before F. GEORGE BARRY, a Notary Public in and for the County of Westchester, State of New York, (certificate filed in New York County), at the offices of Brown & Seward, 261 Broadway, New York, N. Y., beginning on Friday, June 13, 1919, at 11 A. M. 20

APPEARANCES:

ROBERT FLETCHER ROGERS, Esq., and LUTHER E. MORRISON, Esq., for the Plaintiff;
E. CLARKSON SEWARD, Esq., for the Defendant. 30

PAUL J. SALVATORE, a witness called on behalf of defendant, being duly sworn, testifies as follows:

DIRECT-EXAMINATION BY MR. SEWARD:

Q. 1. State your name, residence and occupation?

A. Paul J. Salvatore, Hoboken, New Jersey; in charge of the French Courses at Stevens Institute of Technology, Hoboken, New Jersey. 40

Paul J. Salvatore for Defendant—Cross.

Q. 3. State your education and training in the French language?

A. Bachelor of Arts from Columbia with honors in French and Spanish, completed the courses for the Master's degree with major subjects, French and Spanish, Assistant to Professor C. Fontaine in editing French readers for High School and College use.

10 Q. 4. Have you translated the Belgian Patent to Alphonse Mathern, No. 194731, dated Septetmber 20, 1906, from the French Language into the English language?

A. Yes, I have.

Q. 5. Will you produce that translation together with the actual copy of the patent you translated?

A. Here it is.

20 Mr. Seward: I offer in evidence the copy of patent produced by the witness which is a certified copy of the said patent now on file in the United States Circuit Court of Appeals for the Sixth Circuit; together with the translation produced by the witness, and ask that the two be marked as one exhibit, "Defendant's Exhibit F. Mathern Belgian patent."

Direct-examination closed.

CROSS-EXAMINATION BY MR. ROGERS:

30 x-Q. 6. Professor Salvatore, will you kindly give me the French equivalent for the English word "wrinkle", as applied to stuffs or fabrics?

A. I could use the word "*pli*", the plural being "*plis*".

x-Q. 7. In that event I take it, the word corresponding to the English verb "to un wrinkle" would be "*déplisser*"?

A. I wouldn't very well agree with that, because the dictionaries I have used give no such translation of
40 "un wrinkle",

Paul J. Salvatore for Defendant—Cross.

Q. 2. How long have you taught French at Stevens?

A. Over three years.

x-Q. 8. I am not asking you what the translation of any French word is. I am asking if the French word corresponding to the English "wrinkle" be "pli", how would you translate the English word "to unwrinkle" into French?

A. I would translate the word "to unwrinkle" by the French word "déplier". 10

x-Q. 9. And you do not think that the word "déplisser" is properly to be translated into English as "to unwrinkle" in any circumstances?

A. No, sir.

x-Q. 10. And I take it you would hold the same conclusion with respect to the words "déplissage" and "déplissement", namely, that these words do not properly represent the English words "unwrinkling", etc.?

A. I would. 20

x-Q. 11. Are you of French descent, Professor Salvatore?

A. No. I am of Italian descent.

Cross-examination closed.

Deposition closed.

Signature waived.

Certificate waived.

Frank N. Waterman for Defendant—Direct.

UNITED STATES DISTRICT COURT,

DISTRICT OF NEW JERSEY.

10	FRANK A. SEIBERLING, Plaintiff, AGAINST THE JOHN E. THROPP'S SONS COMPANY, Defendant.	} In Equity No. 614
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Defendant's Testimony.

Testimony taken in behalf of defendant, pursuant to Notice and Agreement of Counsel, before F. GEORGE BARRY, a Notary Public in and for the County of West-
 20 chester, State of New York (Certificate filed in County of New York, State of New York) at the office of Brown and Seward, 261 Broadway, New York, N. Y., on June 12, 1919, beginning at 11 A. M.

APPEARANCES.

ROBERT FLETCHER ROGERS, Esq., and LUTHER E. MOR-
 RISON, Esq. for Plaintiff;
 30 E. CLARKSON SEWARD, Esq., for defendant.

FRANK N. WATERMAN, a witness called on behalf of defendant, being duly sworn, testifies as follows:

DIRECT-EXAMINATION BY MR. SEWARD:

Q. 1. Please state your name, residence and occupation?

A. Frank N. Waterman, Summit, New Jersey, Con-
 40 sulting Engineer.

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Q. 2. Please state your training and experience, briefly, which qualify you to testify as an expert in this case?

A. I graduated from Cornell University in 1889 as Mechanical Engineer and since that time I have been continuously practising in that capacity. For a number of years I was engaged in the design, testing and installation of steam and electrical machinery of various sorts. 10 Since that time I have been acting as an engineer with an office in New York City. I have frequently had occasion to visit tire factories and to examine the various processes and machines involved in the manufacture of bicycle and automobile tires. I have frequently been called upon to act as an expert in litigations involving patents and to give opinions as to the value and operative-ness of machines and processes set forth in patents.

Q. 3. Will you give the names and subject matters of some of the patent suits relating to tires in which you 20 have testified as an expert?

A. I do not remember the names of the parties involved in the cases. I testified as expert in a case involving the fundamental patents for the Dunlop detachable tire, and one involving the removable inner tube and one involving the non skid tread, and several involving the appliances used in the manufacture of automobile tires, the latter including the case of *Goodyear v. Ajax*, relating to a collapsible core for the manufacture of tires; the case of 30 *deLaski and Thropp Circular Woven Tire Co. v. William R. Thropp & Sons Co.*, involving a machine for wrapping tires and molds for vulcanization; the cases of the last named plaintiff against the *Empire Company*, and the *Miller Company*, also involving the tire wrapping machines; the case of the same plaintiff against the *United States Tire Company*, involving molds for holding tires during vulcanization.

Q. 4. Have you read and do you understand the State 40

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patent in suit, and have you read the testimony of Plaintiff's experts Browne and Ray?

A. Yes.

Q. 5. Will you please describe the construction and operation of the machine disclosed in said patent, referring at any time, if you desire, to the testimony of Plaintiff's experts.

10 A. The State patent relates to a machine for manufacturing the shoe or outer casing of an automobile tire. It is in its nature an assemblage of tools which the workman may successively apply, rather than an automatic machine. The general arrangement or grouping of parts is best seen in Fig. 1, from which it will be observed that the machine is double, being in effect two machines in one so that two operators may simultaneously build two tires. To this end, it consists of a fabric supply stand
20 arranged to hold four rolls of fabric of two different widths and of mechanism mounted on a base 1 for driving cores upon which the tires are to be built. The general arrangement of the machine is clearly seen in Fig. 1. A driving motor 49 supplies power to a shaft 53 which in turn communicates it to machine elements at each end of the machine by chain drives such as 55, 56. This power is supplied through a clutch 57, 59 to the shafts on which the cores, such as 115, are mounted, and intermediate mechanism is provided to rotate the core 115 at one or
30 the other of two speeds. The mechanism to which I have been referring is most clearly seen in detail in Fig. 5.

For the purpose of further description, it will be sufficient to refer to one end of the machine only since the two are duplicates and, in general, one end is all that is shown in the several figures, other than Figs. 1 and 5.

Looking at Fig. 2, the core 115 is shown mounted between an assemblage of supply rolls on the left and an assemblage of operating tools on the right. The
40 supply rolls are mounted upon a base 3 serving as a

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support for a turn table 8. A turn table 131 carrying the operating tools is mounted on the base 118.

The tire is built up of superposed layers of the fabric separately stretched upon the core, exactly in accordance with the usual hand methods of making such tires. In Fig. 2, the fabric is shown drawn from a supply roll at 25, the canvas being led from the supply roll under an idle roller 30, over a tension roll 41 and thence onto the 10 core where it is shown in the position for starting the operation. The function of the core driving mechanism previously referred to is to rotate the core while the canvas is being applied, and to this end it is described as provided with low and high speed gear arrangements. In the condition shown in Fig. 2, the workmen would engage the low speed drive to revolve the core 115 slowly, thereby drawing the fabric from the supply and stretching it at the same time. A tension mechanism is provided 20 for the tension roll 36, which is seen at the left of Fig. 2 at 42, 43 and more in detail in Fig. 7 on the same sheet. The purpose of revolving the core by power is to relieve the workmen of the physical strain of stretching the fabric, thereby getting a more uniform stretch. In this stretching operation, the patentee states that the fabric tends to develop troublesome wrinkles which must be gotten rid of and, in an attempt to get rid of such wrinkles, the roller 41 is provided with coarse spiral 30 grooves or screw threads leading in opposite directions from the center of the roller.

After sufficient fabric has thus been drawn from the supply roll to reach once around the core, the machine is stopped and the fabric cut off by hand. The machine is thus not in any sense automatic but is only a convenient support for the several instrumentalities required. The purpose of having several rolls of supply fabric and of having different widths of fabric is that there should be conveniently at hand fabrics of the different widths re- 40

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quired for different layers, and these are made accessible by rotating the turn table 8, and holding it in any position by the lugs 13 which may be engaged by a catch 14.

The several tools which a workmen, in building a tire by hand, would use to lay the fabric down upon the core, are conveniently grouped on the turn table 131, and by turning this turntable (or turret head as the specification calls it) to any desired position, the workman at
10 will bring into use the tool desired. This arrangement of tools on the turn table or turret head, may be seen by referring to Figs. 2 and 9. Thus the tread roller, for rolling the fabric into contact with the tread portion of the core is seen at 141 and it may be moved to and from the core by turning the hand wheel 124, this being turned at pleasure by the workman and not in any automatic way by the machine. When he is through using the tread roll, the workman can bring into play any other tool, as
20 for example the spinning wheels 147 shown in Fig. 9, for smoothing the fabric down along the remainder of the surface of the core. This roll 147 is the ordinary spinning roll or stitcher of the hand building of tires. It is mounted on a lever and pressed laterally toward the central plane of the core by a spring 145, there being however, a handle 142 by which the workman moves the spinning roll at will laterally toward or from the core surface. By turning the hand wheel 124, this spinning roll is moved radially toward or from the center of the
30 core. Thus by simultaneously operating the hand wheel 124 and the handle 142, the operator performs the smoothing down of the fabric against the core, just as was usual in the hand building of tires. Two spinning rolls 147 identically mounted are provided, one to operate on each side of the tire; so that the workman may at will use first one and then the other or both simultaneously.

This same turret head supports other tire making tools, as for example 154 to 156 indicate the elements of
40 a bead placing mechanism, which I understand it is un-

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necessary here to describe in detail. Also 149 shows cutting knives arranged to trim off any excess fabric at the inner edge of the core after the plies of fabric are laid in place.

Thus this turret is a sort of revoluble table upon which the tools which the workman is to use are arranged convenient to his hand.

For mounting the core, a suitable chuck 101 having 10 "centers" 106 is provided. This enables the workman to conveniently dismount the core after the fabrics have been formed upon it and replace it by another core of the same or different size upon which to build another tire shoe. Should he attach a core of another size, the support 118 for the turret may be moved toward or from the core by the screw 121, as seen at the base of the machine in Fig. 2.

The position of the fabric rolls with reference to the core is, however, not adjustable but will vary as the size of tire to be built varies, being fixed far enough away for the largest tire. The fabric rolls are readily removable and may be interchanged when tires of different size are to be built.

Referring now more in detail to the power driving mechanism, by specific reference to Figs. 3, 4 and 5, the core is mounted upon a shaft 90, which shaft may be caused to rotate, or may be held rigid by means of a stop arrangement 93, 95, 97 and 100 shown in Fig. 3. When this stop mechanism is released, the shaft 90, with the core attached to it, is free to revolve. As seen in Fig. 5, this shaft 90 carries a gear 89 meshing with the gear 88 on a shaft 70. The particular arrangement of this shaft is best seen in Figs. 3 and 4. In figure 3, the gear 88 is shown at the left. At the center of the shaft is an adjustable clutch member 71 which is keyed to the shaft, but is capable of sliding thereon to engage with either one or the other of two worm wheels, or spiral gears as the specification

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calls them, 75 and 83, which bear corresponding clutch members 72 and 73. These worm wheels and their clutch members are free on the shaft except when the slidable clutch member 71 is engaged with one or the other of them.

If, for instance, the clutch member 71 is moved to the left (as seen in Fig. 3) to engage clutch member 72, then the worm wheel 75 is made fast to the shaft 70 and that
10 shaft will rotate at the speed at which wheel 75 is driven. If on the other hand, the clutch member 71 is slid to the right and engages the other clutch member 73, then the gear 83 is fast to the shaft, while 75 is free upon it. The shaft 70 must then rotate at the speed at which the worm wheel 83 is driven.

The specification states that the worm wheels 75 and 83 are driven in like manner, each by a worm meshing with the worm wheel. The specific arrangement is shown
20 in Fig. 4, where the worm wheel 75 is shown as driven by the worm 76 mounted on the shaft 58, and the specification states (page 3, lines 123-129) that the wheel 83 is driven by a worm 82 on the shaft 78.

The statements of the specification are conflicting as to which of these worm gear arrangements provides the high speed and there is no consistent description contained in the specification to enable one to understand what the mechanism is by which the particular speeds mentioned are to be attained.

30 Looking for a moment at Fig. 5, it will be seen that the driving power from the motor 49 is transmitted by a chain 51 and shaft 53 to chain 56 which drives one member of a friction clutch 57. The other member 59 of this clutch is controlled at the will of the workman by a clutch shifter 59'. (See also Fig. 1.) The shaft 58 is actuated when the clutch members are engaged and it is this shaft 58 which is seen in Fig. 4 driving the worm 76. If we assume that the shaft 58 is driven by the motor
40 at a speed of 135 R.P.M. and also assume that the worm

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wheel 75 has forty-five teeth, then the wheel 75 and the shaft 70 will revolve at 3 R.P.M., and the shaft 90 carrying the tire core will revolve at 6 R.P.M. 6 R.P.M. is the speed which the specification, page 2, line 3, describes as the proper slow speed for the shaft 90 and this shaft 90 revolves twice as fast as the shaft 70, because of the gear arrangement 88, 89, seen in Fig. 5, where a ratio of substantially 2:1 is indicated.

If the shaft 58 furnishes the slow speed drive, as is understood by Mr. Browne, plaintiff's expert, then the shaft 78 must furnish the high speed drive. On the face of the drawings, however, this is impossible, because the shaft 78 is driven by the chain 80 operating on sprocket wheels having a 3:2 ratio. Thus Mr. Browne's "high speed" driving shaft 78 in fact makes only 2 revolutions, while his "low speed" driving shaft 58 is making 3, or in other words, the shaft 78 rotates at $\frac{2}{3}$ the speed of the shaft 58. Thus if the shaft 58 makes 135 revolutions per minute, as it must to provide the required low speed, then his "high speed" shaft 78 would make 90 R.P.M.

The gears 75 and 83 are shown as of the same diameter and so far as the drawings are concerned are exactly alike. The specification contains the following statement (see page 3, line 123) :

"The clutch member 72 is provided with a hub 74 rigidly secured to a spiral gear 75 adapted to be driven by means of a worm 76 mounted on the shaft 58 just as the corresponding clutch member 73 has a hub 84 secured to a spiral pinion 83 driven by a worm 82 on a shaft 78. The shaft 78 is driven from the shaft 58 by a chain and sprocket connection and the arrangement is such that the spiral gear 83 rotates much more rapidly than the spiral gear 75."

This statement just quoted says one gear is driven "just as" the other but says that by means of the chain

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and sprocket connection "the arrangement is such that the spiral gear 83 rotates much more rapidly than the spiral gear 75". In the drawings, however, the sprocket and chain drive the shaft 78 at a slower instead of a faster speed so that if the shaft 58 rotates 135 revolutions, the shaft 78 would rotate only 90.

The high speed of the machine is stated on page 2, 10 line 8, as 207 turns a minute. If the worm and wheel arrangement for the wheel 83 is "just as" that for wheel 75, then, in order to drive the core at a speed of 207 R.P.M., the shaft 70 must rotate at $103\frac{1}{2}$ revolutions and the shaft 78 at 4657 R.P.M. But if the low speed is correct, the shaft 78 will only rotate 90 R.P.M., which is only about 2 per cent of the necessary speed. Further, a speed of 4657 revolutions is utterly impracticable.

Thus, if we assume that the wheel 75 furnishes the low 20 speed drive, we have a perfectly practicable speed for all of the parts, but the assumed high speed becomes a lower speed and only 4 R.P.M. instead of 207. If, on the other hand, we start with the assumption that the gear 83 is the high speed drive and drives the core at 207 as stated in the patent, then we arrive at an utterly impracticable speed for the shaft 78 and a still more impracticable high speed for the shaft 58.

If we assume that the gear 83 is a low speed drive and 30 figure back, we find that (still assuming 6 R.P.M. as the low speed) the shaft 78 will have a perfectly practicable speed but the high speed drive will then only be 9 R.P.M., while the specification demands 207.

Thus it appears that the mechanism as described is not consistent with and is incapable of furnishing the two operating speeds which the specification also describes and the only two speeds which it mentions.

As I understand the testimony of Mr. Browne, plaintiff's expert, the particular high speed mentioned is unim- 40 portant, but it is essential that to effect the operation,

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which he understands the patentee intends to disclose, the high speed should be more than 50 R.P.M., since, as he has observed, the peculiar operative effects he ascribes to the machine only begin to take place at about that speed. To obtain them in a useful degree I understand him to be of the opinion that the high speed must be considerably higher, as for example 80 to 120 R.P.M. On Mr. Browne's selection of the gear 75 as the low speed 10 gear, the so-called high speed would only be 4 R.P.M., whereas if we assume that Mr. Browne is mistaken and that the gear 83 is the low speed gear, then the high speed would only be 9 R.P.M. So far as it is possible to apply the description of the drawings, therefore, there is no disclosure of any mechanism which can realize or even approximate the speed which Mr. Browne finds necessary to obtain even the beginning of the mode of operation

To get over this obvious difficulty, Mr. Browne assumes 20 that the worm drives 75, 76 and 82, 83 are *not* one "just as" the other as the patent says, but that all the patent means to imply is that both are worm gear drives. The worm gear drive in typical form is one in which the worm rotates very much faster than the wheel; for example, in Fig. 4, the worm 76 rotates 46 times while the wheel 75 rotates once. If the wheel 83 is to be the high speed drive and to realize the speed set forth in the specification (207 R.P.M. for the shaft 90), then obviously the drive 83 must rotate $103\frac{1}{2}$ times while the shaft 78 rotates only 30 90 times. In other words, the worm gear mechanism must actually have an *increasing* ratio instead of the usual greatly decreasing ratio.

It is my opinion that no such arrangement could have been intended by the patentee and, so far as I know, it is impracticable. My opinion is that, assuming the same size blanks, as the drawings clearly show and the specification clearly implies, it would be impracticable to get a ratio of speeds of the wheel 83 to drive the shaft 78 40

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better than about 5:1 if the gears are to be proportioned to transmit the same amount of power. Of course gears of a lower ratio could be made if higher speeds could be employed or if lower power and freedom from shock would suffice. The specification, however, fixes the speed at 207, and under the conditions named it is my opinion that a ratio of 1:5 is the best that could be obtained. This
10 would mean that the wheel 83 makes one revolution, while the shaft 78 makes 5 revolutions.

If therefore, we accept Mr. Browne's conclusion that the difference of speed is to be obtained by giving different ratios to the gearing, then in my opinion the highest speed that would practically be obtained would be about 18 R.P.M. for the wheel 83, the latter making one revolution for every five of the shaft 78. This, however, would make a maximum speed of the shaft 90 and tire
20 core of only 36 revolutions per minute, which is less than $\frac{3}{4}$ of the speed at which, according to Mr. Browne, the essential operation of the machine just begins.

The reason why the worm and wheel combination 82, 83 could in my opinion not be constructed for a ratio higher than about 1:5, is that it would not seem possible to get on blanks of the relative size of those indicated in the drawing (and of the actual size that I would understand would be used in practice) the required tooth dimensions to stand the shock strains. Of course on paper it
80 is easy enough to draw lines indicating a certain number of teeth and certain tooth angles which, if they could be built, would run at the required ratio if they had no work to do. Machines, however, are built to do work and to withstand certain shocks and strains, and gearing combinations, as well as all other parts, are designed by starting with the permissible dimensions and strains as a basis. The difficulty in designing a worm gear for such abnormal speed ratio as would here be required, is that
40 it is difficult or impossible to get a sufficient "root thick-

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ness" for the teeth, and at the same time have such a number of teeth as is required for the speed ratio and to transmit the shocks at the actual required speeds.

I have not actually laid out the gears or made the calculations to determine what would be the minimum ratio that might be obtained, because to do this would be a very long and tedious operation requiring a great mass of calculations and in the nature of a "cut and try" process, and the minimum might easily depend upon some particular ingenious combination of tooth numbers and angles. I am satisfied, however, that for the speeds proposed, the same horse power transmitted, and with the general dimensions that I understand would apply, the ratio of 5:1, which I have given is not very far from the correct one, as the limit, and if forty-five teeth is to be regarded as fixed for the gear 83, then I would be still more positive in my statement that a better ratio could not be expected. 20

I do not desire to be understood as saying that in machine illustration in general or when usual gear combinations are indicated it is necessary that the drawings should show the specific details of the gearing as to the number of teeth and the like, but in this instance a most unusual and extraordinary ratio seems to be required, a ratio so far as I know which has never been attained by worm gearing. Such a problem is not one for the ordinary mechanic and is one which, if solvable at all, is only solvable by virtue of the skill and ingenuity of some gear specialist. 30

In this connection, I call attention to the fact that from Figs. 1, 3 and 4 a definite understanding of the worm gear combination 75, 76 can be obtained, but neither of these figures nor any others give any idea as to the combination 82, 83, except Fig. 3. Fig. 3 only shows the gears 75 and 83 and these only in cross section. Looking 40

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at the upper parts of these cross sectional figures of gears 75 and 83, it will be seen a full tooth is shown in each. But this indicates that each is the usual worm wheel of small tooth lead.

Adjourned to Friday, June 13, 1919, at 10.30 A. M.

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NEW YORK, June 13, 1919, 11.30 A. M.

Met pursuant to adjournment.

Present: Parties as before.

EXAMINATION OF MR. WATERMAN Continued:

To obtain, however, any such ratio as would be necessary to realize a speed of 207 revolutions, or even the 50 revolutions at which the essential action described in this machine is alleged to begin, would require such a lead of
 20 the teeth that more than one tooth would show in the cross sectional illustration of the gear 83 in Fig. 3. It is therefore clear that whoever made the drawings had no intention of illustrating a gear of the abnormal proportions which would be required to realize Mr. Brown's suggested construction.

The supposed mode of operation of the machine is indicated in Figs. 12 to 12C. At page 2, line 43, the specification says "Figs. 12, 12a, 12b, 12c are cross
 30 sections of a ring-core for inextensible edge tires with the fabric in different stages of application;" Again at page 6, line 65, it says, "To this end I use a collapsible ring-core, the shape of which in cross section is shown in Figs. 12, 12a, 12b and 12c. The fabric in the several stages of application is also shown in these figures."

Again, at page 7, line 6, it is said:

"At first the spinning rolls are positioned to act upon the edges of the tread portion of the tire-shoe.
 40 But they are gradually moved radially by the oper-

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ator by operating the hand-wheel 124 so that they pass over the side portions of the tire-shoe as illustrated in Figs. 12a, 12b and Fig. 9."

As Fig. 12a does not show these rollers at all, it is possible that the reference to 12a and 12b should read 12b and 12c. Such a change would make this reference intelligible where as it stands it is not. 10

I have quoted these statements, which are all I find, because these drawings seem to indicate a mode of operation of the machine different from that understood by Mr. Brown, namely, the ordinary hand tire-making process, notwithstanding the fact that the tools provided are the same.

Thus in Fig. 12 the fabric is shown as just touching the outermost portion of the core 136. In the ordinary hand process, as I have seen it and as I understand it is universally employed the fabric and core never assume 20 this relation.

In the hand method of tire-making the fabric is applied by attaching one end to the core after coating the latter with cement and is then violently stretched by the workman as it is laid on. This stretching occurs chiefly along the middle of the fabric and has the effect therefore of curving it so as to shape it to the form of the core over the tread portion or even farther down 30 along the sides of the core. The section of the core and fabric, as thus applied by a stretching process comparable to hand making of tires, would not look at all like Fig. 12 of the State patent. By comparing Fig. 12 and 12a it appears that the intended operation of the State machine is that the fabric should be first laid upon the core stretched somewhat but with a tension very much less than that employed in the hand process, as customarily practised, the tension not being sufficient to fully shape the fabric over the tread portion. It is then apparently 40

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shaped by the application of the tread roller 141, where as in the hand process this roller is used merely to roll out air bubbles and cause close adhesion of the fabric to the cemented core.

10 In the further shaping of the fabric to the core in the hand process, various ways of working were used but a common way, as I understand, was to revolve the core at a comparatively high speed and then, with a spinning or stitching wheel like the wheel 147, pressed hard against the fabric, the latter was spun in place just as metal is commonly spun over a mold by a hand or machine supported spinning wheel. In doing this, however, the spinning wheel is pressed hard against the core so as to squeeze the fabric between the wheel and the core and not at all as in Figs. 12*b* and 12*c* of the patent where the spinning rolls 147 press against or into a fold of the fabric and do not squeeze the fabric against the core.

20 The patentee states at page 2, lines 4 to 11, that he has "discovered" that it is possible to use a very high speed of rotation. Thus he says,

30 "I have discovered, however, that it is not only possible but highly desirable to let the smoothing- and spinning-rolls operate upon the ring-core while this is moving at a much higher speed, say at 207 turns a minute. By this means the machine not only does more work in a given time but it does better work."

At the high speed mentioned the centrifugal force would of course be very considerable since this force varies with the square of the speed. I understand that the theory of Mr. Brown the plaintiff's expert, is that this centrifugal force acts like invisible fingers pulling the fabric radially outward thus forming a loop of the fabric adjacent to the core.

40 Fig. 12*b* appears to support this view of Mr. Brown,

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and shows the spinning rolls as lying and acting in the loop so formed instead of pressing the fabric strongly against the core as in the hand process. Fig 12c makes a similar showing and indicates that this same action of the spinning rolls (upon the fabric only instead of by squeezing the fabric against the core) is continued clear to the extreme inner boundary of the tire.

The foregoing appears to be the intended mode of operation and I find no other indicated by the drawings or specification. However, I call attention to the fact that the drawings disclose no mechanism by which the high speed necessary for this process could in fact be realized. The successive manipulations of the machine by the workmen, as set forth in the patent, are as follows. The tire core 115 having been put in place and coated with adhesive cement, the fabric is attached thereto at its end. The clutch member 71 is shifted to engage the low speed clutch member 72 and the clutch lever 59¹ (Figs. 1 and 5) actuated to cause the motor to drive the machine. Thereupon the core rotates at its slow speed and draws the fabric from the supply roll on to the core, under such an adjustment of the tension device as to produce the condition shown in Fig. 12. The rotation of the core is then stopped and the fabric cut off so that the ends properly lap and this operation of lapping the ends is performed by hand as is also the cutting. The clutch member 71 is then shifted by the workman so as to engage the supposed high speed clutch member 73 and the machine again set in rotation. The turret or turntable 131 is then revolved so as to bring the tread roller 141 into alignment with the core and by turning the wheel 124 the operator causes the tread roller to press and conform the fabric to the tire. I observe that this operation is the one which brings the fabric from the condition shown in Fig. 12 to that shown in Fig. 12a.

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The operator then by a reverse movement of the wheel 124 draws the turret backward to remove the tread roller from the tire and turns it so as to bring into operative position the spinning roll 147 and, by proper operation of the wheel 124 while the handles 142 are manipulated by hand to hold the rollers apart, the latter are brought into position to operate upon the fabric. Precisely what position this would be does not appear from the patent.

10 By further manipulation of the wheel 124 the spinning rolls are moved radially inward toward the centre of the core and the springs 145 tend to press the rollers towards the core while the centrifugal force tends to throw the fabric out and draw the rollers away from the core. On account of the high speed the specification states, page 6, line 36, *et seq.* that the centrifugal force tends to throw the fabric against the spinning wheels and the latter are therefore inclined at a receding angle so that the fabric

20 will not become entangled. It is apparently this opposition of forces which results in lodging the spinning rolls 147 in the bites or folds of the fabric held out by the "invisible fingers" of the centrifugal force.. Successive layers are applied in a similar manner until the tire is ready for the application of the bead core. I do not understand that it is necessary for me to consider the appliances or mode of using them by which this operation is performed. Thereafter further layers of fabric are applied and the specification says that these "are

30 applied to the ring core, precisely as in the case of the layers originally applied". This statement could be regarded as true only so far as application of the fabric down to bead cores is concerned as it is clear that the rolls 147 which are shown could not operate around these beads. It is apparent that any application of the fabric around the bottom of the beads could only be effected by some other tool such as a spinning roll held in the hands of the workman in accordance with the prior practice in

40 the hand building of tires.

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Q. 6. Does the patent in suit describe the amount of stretch or tension to be applied to the fabric in a circumferential direction while being drawn onto the core?

A. It does not. It merely refers to the tension as "the proper tension" and leaves the amount to be determined in view of the described operation as illustrated, for example, in Fig. 12.

Q. 7. Does the patent indicate anywhere that the fabric is stretched on with sufficient tension to cause it to adhere to the tread portion of the core? 10

A. By tread portion as used in the question I understand it is intended to designate the portion ordinarily indicated by that word, namely the outer third or more of the surface upon which the wear comes when the tire is in use.

The patent does not anywhere indicate that the fabric is so stretched as to cause it to be conformed to or to adhere to the tread portion of the core. The only light 20 thrown on the matter is that afforded by Fig. 12 which shows that it is not so stretched and by the description and comparison of Figs. 12 and 12a which indicate that the action of the tread roller 141 is necessary to form the fabric to the core.

Q. 8. Does the patent suggest any means for shaping the fabric to the tread portion of the core except the tread roller 141?

A. It does not, and on the other hand, at several places 30 in the specification the tread roller is described as acting to shape the tread portion of the fabric against the core. I refer for example to page 6, line 141, also line 122, also page 5, line 7.

Q. 9. Does the patent suggest that as a result of the operation of the machine there is any re-arrangement or any particular arrangement of the threads of the fabric due to circumferential stretch or radial stretch, or anything else? 40

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A. It does not, nor am I able to find any statements from which any inferences on these matters may be drawn. The specification refers to the shaping of the fabric by the action of the tread roller and the spinning rolls, but whether this is by alteration of shape of the meshes of the fabric or by stretching or by compression of the fibers does not at all appear.

10 Q. 10. Does the patent suggest the use of any high speed rotation of the core other than approximately 207 R.P.M.?

A. It does not. The patentee sets forth the use of this high speed as a discovery of his own appearing to indicate something materially in excess of previously known speeds. The same indication is made by the special mode of operation apparently intended to be indicated by Figs. 12 to 12c.

20 Q. 11. Do you think that, with a speed of about 207 R.P.M. for the core and with the spinning rolls 147 pressed laterally by springs, as described, the method of operation indicated in Figs. 12b and 12c might take place?

A. Yes. Indeed, the position of parts as indicated in those figures, would apparently only result from the use of speeds substantially of the order stated as the high speed of the patent.

30 Q. 12. Is there anything in the patent which suggests that the benefits of any method of operation begin to be obtained at about a high speed of 50 R.P.M. and are fully obtained at a high speed of about 80 R.P.M. to 120 R.P.M.; or any suggestions of that nature?

A. There is not. It only refers to a speed "much higher than the low speed" and illustrates what is much higher by "say at 207 turns per minute" the low speed being given as 6. The selection of 207 turns rather than say 200 turns or 205 turns per minute seems to indicate
40 some special significance as though perhaps 207 might

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be a lower limit for the particular sort of operation discovered by the patentee.

Q. 13. Does the patent suggest the pressure to be exerted by the springs which press the spinning rolls laterally toward the core?

A. No, except to say (page 5, line 113, *et seq.*), that the springs exert the pressure which would be exerted by the hand of the workman using a hand tool for the same purposes. Of course, the pressure exerted by the workman with a hand tool is a pressure co-ordinated to much lower speeds, probably not more than half the speed stated by the patentee or thereabouts. It is perhaps through the use of this ordinary hand pressure and the excessive speed mentioned that the patentee made the particular discovery which he refers to and by virtue of which the peculiar operation of Figs. 12 to 12c is obtained. In other words, the high speed would result in a centrifugal force several times as great as would result from the more usual speeds and if only the force supplied by the workmen was used such excessive centrifugal force might lift the rollers away from the core as is clearly indicated in Figs. 12b and 12c.

Q. 14. Does the patent suggest that the use of the high rotative speed of the core is desirable in connection with the operation of the tread roller as well as in connection with the spinning roller?

A. Yes. For example, at page 6, line 120, *et seq.*, it is expressly stated that the fast speed mechanism is brought into play before the tread forming roll is used. For example, referring to Fig. 12a it will be seen that whereas in Fig. 12, which shows the low speed operation, the fabric is concaved inward. In Fig. 12a its exposed edges are concaved outward as a result of the high speed, and that the edges of the roll 141 seem to bear about the same relation to the fabric as will the later applied spinning rolls brought into use as illustrated for example

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in Fig. 12*b*. It will be seen therefore that the patentee assumed the same co-operation between the high rotative speed and the tread roller as he assumes between that speed and the spinning rollers.

Q. 15. Does the patent show or describe any arrangement of springs which would impart a uniform lateral pressure to the spinning rolls 147 throughout their operation?

A. It does not. The pressure would obviously be greatest when the spinning rolls are most separated and would decrease as they approach one another in assuming the position shown for example in the upper part of Fig. 9.

Q. 16. Have you seen in operation certain tire making machines which purport to be the machines of the State patent?

A. Yes. I have seen a number of them and particularly at the Goodyear factory where a number of them were exhibited to me by plaintiff's counsel and expert Mr. Ray.

Q. 17. Will you state whether or not there were any important structural differences between those machines you saw at the Goodyear plant and the machine shown and described in the patent in suit; and if yes, point out some of the more important differences?

A. There were a number of differences which might be regarded as important.

30 THE STRETCHING ROLL. In the machine of the patent the stretching roll 36 is cylindrical, therefore not tending to stretch the centre of the fabric which goes onto the core in an unstretched condition as indicated in Fig. 12. In the machines exhibited to me the stretching roller was barrel shaped and tended to stretch the centre of the fabric, as was also the roller 41 which does the lateral stretching or smoothing. The fabric therefore did not go
40 on the core as indicated in Fig. 12 of the patent but went

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on just as in the hand building process, namely in a formed condition, the formation being produced by the central stretch. The tension on the tension roller was such as to produce this stretch and the convex form or barrel shape of this roller co-operated with this increased tension to pre-shape the fabric by stretching.

LATERAL STRETCHING ROLL. The lateral stretching roll 41 was in some cases convex and in others cylindrical but in no case did it prevent longitudinal creases, and the workman was compelled to remove them by taking hold of the fabric and vigorously stretching it laterally. This indicated that a forming by stretching was practiced in the machine, not described or contemplated in the patent. 10

CORE SPEEDS. I at once observed that the gears occupying positions as shown in Fig. 3 of the patent had opposite functions than those ascribed to them by Mr. Browne, namely, the gear in the position of the gear 83 was a worm wheel giving slow speed, this speed being 8 R.P.M. instead of 6 as stated in the patent. The worm and gear were normal in construction but appeared to have a ratio of 25 to 1 instead of 45 to 1 as Fig. 4 of the patent is interpreted by Mr. Browne. 20

The high speed was 120 R.P.M. instead of 207 and the gear mechanism which produced it occupied the position of the wheel and worm 75, 76 in Fig. 3, but were not a wheel and worm but on the contrary were a pair of spiral gears having a different ratio of diameters and a speed ratio of 1 to 1 instead of 45 to 1. It is evident therefore that this part of the machine has been completely redesigned as compared to the structure shown and described in the State patent in respect of these speed change mechanisms. 30

THE TREAD ROLLER. In the Goodyear machines exhibited to me the tread roller was not mounted on the 40

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turret 131 but was separately mounted on the standard 118 and was operated by a foot treadle and I observed that the operator used it at the same time that he operated the spinning roll instead of successively as indicated in the patent.

THE SPINNING ROLL. The spinning rolls alone occupied the turret (there being no bead placing or cutting mechanisms mounted thereon). The mode of mounting of the arms carrying the spinning rolls was quite different from that shown in the patent, the arrangement being such that a single handle replaced the two handles 142. The machines shown me were not all alike, but the arrangement in each case was such that the spring played little or no part in the operation, the pressure being as I judged practically wholly applied by the operator leaning heavily against this handle while performing the spinning operation. In other words, the operator appeared to be making fully as much physical effort in this spinning operation as in the cases where I have seen the spinning operation performed by hand. The particular mechanism by which one handle replaced the two of the patent differed, but the leverage apparently did not differ materially and whether it was arranged to move in a horizontal plane as in one instance, or in a vertical plane as in another, the same considerable effort was exerted by the operator, apparently.

ACTION OF THE SPINNING ROLLS. The spinning rolls appeared relatively larger than is indicated in the State patent and they acted under the heavy pressure applied by the operator against the core as in ordinary hand spinning and there were no evidences of any invisible fingers pulling the fabric out and lifting these rolls from the core as indicated in Figs. 12*b* and 12*c*. In other words, these spinning rolls certainly did not act in bights or loops of

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the unapplied fabric as indicated in these figures of the patent but did manifestly compress or pinch the fabric between the roll edges and the core precisely as in hand spinning; and this was evidenced when the spinning was completed by the pressure line left on the fabric which showed the path of travel of the spinning roll thereon and could not have been caused by the roll acting in a loop or hight as indicated in the patent. Such a line is left by the 10 hand spinning roll as used in the hand spinning as I saw it in use many years ago.

APPLICATION OF THE BEADS. The bead placing mechanism of the patent was entirely absent and the beads were applied by the aid of a bead placing ring, the method not in any way resembling the disclosure of the patent. No attempt was made to spin the fabric around the bead core with the spinning roll of the patent nor to trim the fabric while in the machine as there was no trimming 20 mechanism provided. The core with the partially built carcass upon it, was removed from the tire building machine and these operations were performed by hand in the usual manner.

QUALITY OF WORK. The work which I saw was not as the patent says (page 7, line 49) "better than they can be made by hand", but was extremely poor, much worse than I remember having seen it done by hand and indeed 30 the faults of the machine had to be remedied by hand both while the core was attached to the machine and after it had been removed therefrom.

In practically every layer of fabric applied very large and very bad wrinkles were formed and it was necessary to stop the machine and lift up the fabric and smooth it down by hand with a spade, after having applied cement underneath in some instances. In fact the word "wrinkles" appears too mild to apply to some of these as 40

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they were not single wrinkles but groups covering considerable areas in which the fabric was mussed instead of smoothed there being colonies of wrinkles.

METHOD OF OPERATION. The method used by the operator when I saw him operating the machine, was the customary procedure of hand building of tires in which the fabric is stretched, to shape it to the core, and the rollers
10 act toward the core to pinch the fabric against it and was not the method shown and described in the State patent in which the fabric is not stretched to shape it to the core and the spinning rolls act in a bight of the fabric and do not pinch the latter against the core. The fabric was very largely formed to the core by the act of stretching it and drawing it from the stock roll over the convex stretching roll. This stretching brought the fabric into
20 contact with the core over fully a third of the surface of the latter. It was then only necessary for the tread roller to perfect the adhesion and the latter had no smoothing or shaping effect whatever to do so far as I could observe.

The fabric was so far shaped as to require less conforming or shaping to the core than would be the case in the mode of operation of the patent and the centrifugal force was of a much lower order. The spinning roll therefore was caused by the workman to act exactly as in hand spinning. The spinning around the bead was done
30 by another workman who spun the core by hand and spun the fabric around the bead with an ordinary hand spinning tool. The trimming was also done by this second workman with a hand tool, and not by the machine.

Q. 17. Have you read the disclaimer filed by the plaintiff in connection with the State patent in suit, and do you understand same?

A. I have read the disclaimer several times with great care. In so far as it canceled certain claims, as too broad
40 and including what State did not invent, and in so far as

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it canceled certain portions of the specification I understand it; but as to those portions which disclaim claims 4, 5, 6, 7, 12, 13, 22, 23, 24, 25 and 26, except when the recited elements are in some vaguely suggested relation I have been unable to form any definite idea of the meaning.

Mr. Seward: I offer in evidence a printed copy of British Patent to Will Charles State No. 25588 of 1909 accepted April 28, 1910 and ask that the same¹⁰ be marked "Defendant's Exhibit G, British Patent to State."

Q. 18. Have you examined this British Patent to State, Defendant's Exhibit G?

A. Yes.

Q. 19. Will you state whether or not this patent shows and describes substantially the same machine as is shown and described in the patent in suit?

A. It does.

20

Q. 20. Do you find in this British patent any figures of the drawing which corresponds with Figs. 3, 4 and 5 of the State patent in suit?

A. Yes, all of the drawings appear to correspond figure for figure, and reference letter for reference letter.

Q. 21. Will you refer to the description contained in this British patent with particular reference to the gears 75 and 83, and their connected parts, and explain what the patent sets forth as to the relative speed of the³⁰ said gears in operation?

A. In general the language of the specification of the British patent corresponds to the language of the United States patent. In the description of the gears referred to, however, there is a noteworthy difference in that the words "much more rapidly" found at page 4, line 3, as contrasting the speed of the gear 83 with that of the gear 75, are replaced in the British specification at page 4, line 49, by the words "more slowly".

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I have pointed out that the United States patent specification is inconsistent with itself in its designation as to which of the two worm gears is the slow speed and which the high speed. Thus at page 4, line 3 it is said that the gear 83 "rotates much more rapidly than the gear 75", but in lines 11 and 12 of the same page, the sequence makes it clear that the reverse is intended and that the gear 83 rotates more slowly than the gear 75. On
10 page 4, lines 77 to 79, the patentee states that the clutch 73 attached to the gear 83 is the slow speed mechanism and that the clutch 72 attached to the gear 75 is the high speed mechanism. Thus in two out of three places in the specification it is stated that the construction is not as assumed by Mr. Browne, namely, with some unknown and unshown high speed gear mechanism, but that the high speed gear mechanism is that shown in Fig. 4, indicated by the reference numerals 75 and 76 therein. The
20 British patent statement is consistent in this regard since it expressly states in the passage corresponding to the one selected by Mr. Browne in the United States patent, that "the arrangement is such that the spiral gear 83 rotates more slowly than the spiral gear 75".

If the gear 75 is a high speed gear then the sprocket and chain arrangement will cause the shaft 78 to rotate slower than the shaft 58 and this of course is a rational arrangement. And if the worm and worm wheels are
30 alike and the high speed is 207, then the low speed would be 138 R.P.M. which of course is entirely impracticable being 23 times as fast as the slow speed suggested by the patentee. The ratio of the worm and worm wheel is already 45 to 1. To get a speed of 6 revolutions per minute the gear ratio would have to be 1035 to 1 which of course is utterly impossible within any rational or permissible dimensions.

If the gear 75 is the high speed gear and the high
40 speed is 207 revolutions as the patent states, then the

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shaft 58 bearing the worm 76 would make 4057 revolutions a minute which is also impracticable. In the first place in machines of this character such speeds are intolerable on account of bearing and lubrication difficulties, but the absolute bar is the fact that worms cannot be run at any such surface speed. They immediately cut themselves to pieces.

Thus even with a consistent specification such as the British patent furnishes, we arrive at an impossible machine, and whether, therefore, Mr. Browne's view of the United States patent specification is taken or the description of the British specification be accepted, no disclosure of an operative machine capable of realizing the speeds set forth in each of the patents is found. Also if, in either case, we attempt to secure the result by changing the gear ratio of the worm and worm wheel we find that impractical constructive conditions are imposed which prevent such a solution of the difficulty.

Q. 22. Have you examined the drawing produced by Mr. Browne, after consultation with Mr. Ray, and offered in evidence as "Defendant's Exhibit A, Browne's Sketch of Gearing"; which drawing was suggested by Mr. Browne as a substitute for the worm and wheel 82, 83 of the patent in suit in order to obtain the high speed of 207 R.P.M. for the core? If you have examined this drawing, will you kindly state what you have to say with regard thereto as a proper interpretation of that part of the patent in suit?

A. I have examined the drawing. Such a drawing does not answer the question whether or not the gear can be made and transmit the necessary power. It is based merely upon working backwards and assuming that approximately the correct speed ratio can be obtained but does not show how it can be obtained.

The drawing of the patent shows in Fig. 4 an ordinary worm and worm wheel mechanism of recognized pro-

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portions and presents no problem to any mechanic. The patent further says that the other one of the two worm and gear combinations is "just as" the first. Mr. Browne's sketch, Defendant's Exhibit A, does not show such an arrangement but on the contrary presents a problem (not a solution) in spiral gearing. This problem would have to be solved either by calculation or experiment, 10 probably the latter, before anyone could tell whether teeth of proper proportion to stand the strains and transmit the necessary power could be cut of the required number and at the required angle on blanks of the relative diameters given and have the necessary strength.

If the description and drawing of the patent is to be disregarded in the effort to obtain the speed called for, namely 207 R.P.M., my judgment as an engineer would be that it would be better to re-design the mechanism and 20 adopt some more normal arrangement than that indicated in Mr. Browne's sketch, Exhibit A. I may note that in the Goodyear machines which I saw, even though the speed requirement was much less exacting, namely only about 120 R.P.M., the high speed gear mechanism had been re-designed, the worm wheel being abandoned and a pair of spiral gears of approximately equal diameter substituted therefor. Mr. Browne's sketch of gearing is not a drawing showing gears but merely a diagram indicating 30 only what he assumes, namely, that if you have 22 teeth on each of two gears they will run at 1 to 1 ratio if they run at all. But of course anyone knew that without a diagram, also any engineer knew that the sum of the angles of the teeth of the two members had to be 90 degrees, but this is all that the sketch shows. Of course the diagram does not show and I understand does not purport to show an arrangement which would operate.

Q. 23. Am I correct in understanding from your testimony that, as you read the drawings of the State patent 40 in suit and the parts of the specification descriptive

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thereof, the worm and wheel 76, 75 are the same as the worm and wheel 82, 83, and that the difference in speed of the wheels 83 and 75 is due to the difference in size of the sprockets around which the chain 80 passes, the arrangement being such that the wheel 83 rotates more slowly than the wheel 75?

A. Yes, I will refer to the specification beginning at page 3, line 123 and extending to page 4, line 4: Since the 10 sprocket chain obviously rotates the shaft 78 and hence the gear 83 more slowly instead of more rapidly, it appears likely that the draftsman of the specification reversed the reference numbers in lines 2 to 4 of p. 4, and that he intended to say that the spiral gear 75 rotates much more rapidly than the spiral gear 83. This would make the passage consistent with the sentence beginning line 8 of the same page and also the passage beginning at line 73. It would also then bring the specification into 20 agreement with the British Patent of State.

The criticisms which I have made of the machine on this interpretation would still apply, but the specification would not be inconsistent with itself as it now is.

Q. 24. If the patentee had intended that the gear wheel 83 should be part of the high speed drive, can you conceive of any reason why he should have arranged the sprockets and chain 80 so as to cause the shaft 78 to rotate more slowly than the shaft 58?

A. No, from a mechanical point of view such an 30 arrangement is quite irrational.

Q. 25. If the patentee had intended to use a pair of spiral gears for obtaining his high speed, as is suggested by Mr. Browne, can you conceive of any reason why he should place them in the position of the worm and wheel 82, 83 instead of in the place of the worm and wheel 76, 75, considering, as you have already described, that the shaft 58 is more directly driven from the source of power than 40 is the shaft 78?

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A. No. The shaft 58 is the natural one from which to take the high speed drive since the driving motor is naturally the high speed device and the high speed drive of the machine should therefore be naturally taken from the shaft driven by the motor with the least reduction. In other words, there is no good reason in the mechanics of the structure why the designer should deliberately
10 elect to take the loss of power necessarily involved in first gearing down and then gearing up again.

Q. 26. If the arrangement shown on the sketch of Mr. Browne's, Defendant's Exhibit A, were intended to be represented by the patentee, by the parts 82 and 83, how would the cross section of the gear wheel 83 differ from that shown in Fig. 3 of the drawings of the patent in suit?

A. The drawing of the patent in suit would then show the gear 83 as having sections of 3 teeth indicated instead
20 of a side view of one complete tooth as it now is. I note that Mr. Browne's sketch of gearing, Defendant's Exhibit A, is incorrect in its upper left hand figure if that figure is intended to represent the vertical cross section of the lower right hand figure, just as Fig. 3 of the patent would have to be regarded as incorrect if there was any evidence to indicate that it was intended to show such a gear arrangement as that of the lower right hand figure of Mr. Browne's sketch. Mr. Browne's upper left hand figure,
30 however, is not only incorrect in improperly showing the teeth of the wheel 83, but it is also incorrect in failing to show the teeth of the wheel 82. In other words, Mr. Browne's upper left hand figure would correctly illustrate the cross section of what the patent actually discloses, but incorrectly illustrates the structure of his lower right hand figure which he proposes to substitute. The gear 82 in the upper left hand figure should show in cross section 22 teeth instead of indicating as it does, the single thread worm.

40 Q. 27. If the patentee had wished, would there have

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been any difficulty in showing several teeth in section on the gear wheel 83 in Fig. 3 of the drawing of the patent, instead of 1 tooth in side view?

A. Not the slightest, just as there is no difficulty in showing 45 teeth in the gear 75 in Fig. 4.

Adjourned to Saturday, June 14, 1919, at 10.30 A. M.

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NEW YORK, June 14, 1919, 10.30 A. M.

Met pursuant to adjournment.

Present: Parties as before.

EXAMINATION OF MR. WATERMAN CONTINUED:

Q. 28. Have you read Defendant's Exhibit F, ²⁰ Mathern Belgian Patent, and the translation thereof included in said Exhibit, and do you understand the same?

A. Yes.

Q. 29. Have you had set up and seen in operation a tire making machine made substantially in accordance with the disclosure of the said Belgian patent?

A. Yes.

Q. 30. Is that machine represented in the set of 18 pho- ³⁰ tographs Defendant's Exhibit D?

A. Yes, except that both rolls over which the fabric passed on its way from the stock roll to the core were oval shaped instead of one oval and one spherical, and that there is only one bevel gear arranged with its axis in line with those of the oval rollers exactly as shown in Fig. 1 of the Belgian patent, instead of two on each side as shown in photographs. Also the spinning rolls were made to avoid a criticism made in the other case in that the support on the inside, that is the side towards 40

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the tire, is of the same thickness as the supporting hook instead of thinner than the supporting hook as is shown in the photographs. This thickness bears the same relation to the dimensions of the roller as is indicated in the drawing of the Belgian patent, Fig. 6. All of these changes were made under my direction upon my attention being called to the fact, by counsel for defendant, that the
10 machine shown in the photographs had been criticised in these respects by counsel for plaintiff in the former suit of Seiberling against Firestone. I do not regard any of these changes as material. The replaced parts shown in the photographs have been retained without alteration of any kind.

Mr. Seward: The machine referred to by the witness is offered in evidence as "Defendant's Exhibit H, Machine of Mathern Belgian Patent."

20

(Witness continues his answer.) I may say that we also used a round sided core instead of one having flat sides to meet another objection raised in the former case. I will also state that I did not change the separation of the pins 35, notwithstanding objection made on this ground in the former case, because on comparing the separation with the distance from the central plane of the core to the central plane of the feed screw as shown in Fig. 3, I found their present separation to be sub-
30 stantially correct, that is, as close as may be reasonably scaled from so small a drawing. This criticism therefore appeared to be without foundation.

Q. 31. Will you please describe the construction and operation of the machine shown and described in the said Mathern Belgian patent, and compare the same with the construction and operation of the machine set forth in the State patent in suit?

A. Like the machine of the State patent the Mathern
40 Belgian patent shows a machine provided with means

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for supporting the supply of fabric, conveniently supported tools for hand guidance and control, and means for rotating the tire core at low speed for drawing the fabric onto the core and a high speed for laying it smoothly in adhesive contact with the whole surface of the core. Like the State machine, the Mathern machine of the Belgian patent includes spinning or stitching rolls, a bead placing device and a trimming tool. Unlike the 10 State machine, however, the Belgian patent machine discloses automatic means for feeding the spinning rolls inward radially as the fabric is being spun upon the core, whereas the only means which the State patent shows is a hand wheel 124 which the operator must manipulate in order to cause the spinning rolls to progress radially inward. Also unlike the State machine, the gearing arrangements for obtaining the two different speeds are fully and clearly disclosed and of a type universally 20 used for the speed changes in lathes.

The machine comprises a bed plate 1 upon which a bearing supporting frame 2 is mounted. This also carries the column supporting the automatic feed mechanism and guideway for the several tools.

The tire core 10 is mounted upon a shaft 12 which in turn is mounted in bearings on the frame 2. Parallel to the shaft 12 and to the left thereof as seen in Fig. 2 are two shafts 11 and 13 and these are arranged to be 30 connected in either of two manners by gears 4 to 9. The gear 9 is mounted upon the core shaft 12 but is free thereon except when engaged by the clutch member 15 which is keyed to the shaft 12. A pinion 8 on the shaft 11 is permanently in mesh with the gear 9 and permanently connected to the gear 7 also on the shaft 11 and keyed thereto. Also on the shaft 11 is a step pulley 3 on which a driving belt for supplying the motive power is to be placed. Attached to this step pulley is a pinion 4 but this pulley and pinion are free from the shaft 40

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except when clutched thereto by a clutch not lettered but clearly shown in Fig. 2. The shaft 13 carries a gear 6 meshing with the pinion 4 when desired. This gear 6 has attached thereto a pinion (designated 5 in the specification) which meshes with the gear 7. The shaft 13 is mounted in eccentric bearings rotatable by the handle 14 so that the gear 6 and pinion 5 may be thrown
10 into and out of mesh with the pinion 4 and gear 7 respectively according as low or high speed is required. When all the gears are in mesh as indicated in the drawing, and power is applied to the pulley 3, this pulley rotating freely upon the shaft 11 will drive the gear 6 and the pinion 5 associated therewith at a slower speed. The pinion 5, being meshed with gear 7, will drive the latter at a still slower speed and the pinion 8 meshed with the gear 9 will in turn drive the latter and the
20 core at a still further speed reduction.

The Belgian patent describes this low speed as that "sufficient" for all of the low speed operations and it will be observed that the means of getting this low speed is the ordinary "back-gear", shiftable by lever 14, this being the universal method of doing exactly the same thing in lathes and in other machines where a work shaft is to be turned at two different speeds. In addition a step pulley 3 is provided, so that altogether such a machine
30 may operate at 6 different speeds or at 2 different speeds for every position of the driving belt.

The gear ratio as approximately indicated by measurement on the drawing is $4\frac{1}{2}$ to 1 for each step in the gear train, which makes a ratio of 91 to 1 from the driving pulley 3 to the core 10. Thus if the core has a slow speed of 4 revolutions per minute, which would be as slow presumably as it would ever want to be run, the driving pulley would have a speed of 364 revolutions which is a practical and usual speed for such a driving pulley. The
40 steps of the pulley would then provide for low speed

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drives of 4, 6 and 8 revolutions per minute according to which step of the pulley the belt was applied to, and the driving pulley speed, from a constant speed original source of power, would vary from 364 to 728, an entirely common and usual range. The speed drive is thus a practical one.

The purposes for which the low speed drive is intended are stated on page 2 of the translation as follows: 10

“The core 10 under this condition rotates at a speed sufficient for winding on the strips of fabric, placing the beads, placing the rubber strips, etc.”

These several operations then the patentee contemplated would be performed with the back gear lever 14 moved to mesh the gear 6 and pinion 5 with pinion 4 and gear 7 respectively. 20

To obtain a high speed the lever 14 is moved to throw the back gear out of mesh and the pulley 3 is clutched to the shaft 11 precisely as the similar operation is performed in a lathe. This alters the speed ratio by $4\frac{1}{2}$ to 1 so that the ratio of the low speed to the high speed for the same position of the driving belt is 1 to $20\frac{1}{4}$. This means that if the low speed is 4 revolutions per minute the high speed would be 81 revolutions per minute. If the low speed were 6 revolutions per minute the high speed would be $121\frac{1}{2}$. If the low speed were 8 the high speed would be 162 R.P.M. 30

Mathern states in the last paragraph of page 2 of the translation, that the high speed so obtained is the speed which is “necessary” for spinning the fabric into close contact with the core. His statement reads as follows:

“When this is done, (back gear thrown out) and core is clutched to its shaft, the pinion 8 keyed on the latter directly drives the shaft 12 through the wheel 40

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9 and under this condition the core 10 has the speed which is necessary for removing the puckers from the fabric strips on the core, for trimming off the fabric strips, for rolling the finished carcass, etc."

10 It will be noted that the patentee appears to distinguish between the speed which is "sufficient" for winding on the fabric and the high speed which is "necessary" for the spinning operation. I understand that Mr. Browne, plaintiff's expert, says that the necessary effect of speed only begins at 50 revolutions per minute and is practically realized at from 80 to 120 revolutions. I assume (adopting the results of Mr. Browne's experiments) that this necessary speed referred to by Mathern, is 80 to 120 revolutions which gives a low speed of 4 to 6 R.P.M. which is known to be "sufficient" although not the upper
20 permissible limit. Thus the speeds in all parts of this driving mechanism are in every way practical and expected, and if the machine were simply set up and driven at what an ordinary machinist would recognize as a suitable or ordinary speed for a machine of this general type, the resulting high speed would be substantially that which Mr. Browne finds desirable.

The stock roll containing the prepared fabric is indicated at 18 mounted upon the squared end of a shaft 20
30 mounted in slidable bearings 25 so that its distance from the core may be regulated to adapt the machine for different sizes of cores. The flanges 19 of the stock roll are also adjustable so as to provide for different widths of fabric. To provide the tension the shaft 20 also has mounted upon it a drum 21 about which brake bands 27 are wound and arranged to be tightened by a screw and wheel 22, 23 against the tension of a spring 24, thus providing a uniform elastic tension adjustable at will.

40 Adjourned to Monday, June 16, 1919, at 10.30 A. M.

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NEW YORK, June 16, 1919, 10.30 A. M.

Met pursuant to adjournment.

Present: Parties as before.

DIRECT-EXAMINATION OF MR. WATERMAN continued:

From the stock roll 18 the fabric passes to the pair of spherical or oval rolls 26 and thence to the core. These 10 rolls thus constitute a means, as the patentee points out, of stretching the fabric in the middle to shape it to the core when the brake-wheel 23 has been adjusted to produce the required tension. This is described beginning at the last paragraph of page 3 and including the first two paragraphs of page 4 of the translation. According to the specification there is mounted at each side between the rolls 26 a pair of conical gears 36 between which the fabric passes, the purpose being to produce a uniform puckering of the edges of the fabric to facilitate the contraction thereof when the fabric is spun down against the core. 20

Thus in the act of stretching the fabric on to the previously cemented and therefore sticky core, the patentee shapes it by stretching the middle. It will be recognized that, if a fabric be stretched along its centre, it will at once take a curved form, and according to the amount of stretch given the fabric, can be more or less completely pre-shaped. 30

The pre-shaped portion then has to be stuck down against the core with the air bubbles completely eliminated. This is effected in the Mathern machine by a pair of rolls 30 mounted symmetrically to the plane of the core upon a pair of pivoted levers which in turn are mounted upon a slide in a casing 28. This slide is reciprocated a short distance back and forth by a crank shaft 33. The casing 28 is mounted on a slide 34 adjustable by a hand wheel to accommodate the different sizes of 40

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tire. As the material is being stretched upon the core the rolls 30 are reciprocated by shaft 33 and the shaped portion is closely pressed on to the cemented core.

It remains to shape and apply the previously unshaped fabric portions and this is done by the tool shown in Fig. 6 which comprises a spinning wheel mounted at a receding angle upon a bar bent to embrace the rod 35 attached to a vertically-sliding tool supporting member 17 seen in Figs. 1, 2 and 3. This tool supporting member is in effect a heavy plate mounted in guideways on the column 16. A feed screw determines the position of this slide 17 and is adjusted by a hand wheel at the top and may be automatically fed downward by a pawl mechanism 34. Thus the spinning rolls progress radially inward along the tire surface but in a vertical direction instead of in a horizontal direction as in the State machine.

20 The spinning rollers arranged as shown in Fig. 6 are very cleverly devised so that they merely hook over journal pins 35. They are guided and pressed to the work by the hand of the workman applied to handles thereon as clearly appears in Fig. 6. It results from this mode of mounting not only that they are readily applied and removed, but that if they encounter an obstacle while being positively fed downward, they simply lift from their pivots. Thus if they should happen to come down on top of the core, they would lift instead of jamming and breaking something. Similarly if they should run
30 against the bead after it had been applied, they would lift instead of forcing the bead out of place. At the same time they are completely under the control of the workman.

It results from this arrangement that it is impossible for these rollers to act on the tread portion as they would simply be lifted off from their supports, but this portion has already been applied by the rollers 30 and the action
40 of the spinning roll is not needed. They therefore act

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on the sides of the core where the fabric has not been previously formed by stretching.

After the layer of fabric has been stretched on the core and applied thereto by the rollers 30 so far as prepared for that purpose by stretching, the workman stops the machine, cuts off the fabric and properly overlaps and presses together the slightly overlapped ends. He then by means of the hand wheel adjusts the position of 10 the slide 17 so as to bring the spinning roll of Fig. 6 about to the level of the top of the core. He then starts the machine and assumes the position for holding the handles of the spinning tools, there being two of these, one for each side of the core. By the time he has assumed this working position and is ready to apply pressure, after having started the machine, the spinning rolls will have reached the proper level to begin action and the operator presses them heavily against the core thereby pinching 20 the fabric between the spinning rolls and the core and spinning it smoothly into shape simultaneously applying it to the cemented surface of the core.

Other layers are put on in similar manner and, at the proper time, the beads are put in place by the tool hook shown in Figs. 7, 8 and 9. I do not understand, however, that these further steps are of interest herein and I therefore omit a description of them. I note however that the Mathern machine is provided with all the tools which the State machine has and in addition is provided with means 30 for applying the tread rubber after the canvas carcass has been completed. This is shown in Figs. 10 and 11.

Thus I find from this comparison that the Mathern machine supplies all of the tire making instrumentalities furnished by the State machine, but, whereas the State machine is a mere aggregation of the tools, the Mathern machine has automatic feeding means making it in a real sense an automatic machine, as distinguished from an assemblage of tools.

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Like the State machine, as described in the specification of the State patent, the Mathern machine provides a sheet fabric supply roll together with suitable tension means and guide rolls, but these are clearly described as arranged to pre-shape the fabric by stretching, which is not provided for in the State patent. Also the Mathern machine has a power driven ring core having a slow
10 speed mechanism to actuate the core when it is receiving fabric from the supply roll and a high speed mechanism for actuating the core while spinning the fabric against the core, and associated therewith change speed mechanism (lever 14 and eccentric bearings) for permitting the operator to select the desired speed. Unlike the State patent, this Mathern patent shows and describes a practical form of change speed mechanism whose constructional and operating characteristics are well known, while
20 the State patent does not appear to disclose any practicable mechanism. The Mathern machine also has a radially moving support 17 and a pivotally mounted supporting arm (Fig. 6) on which is mounted a spinning roll as in the State machine. Mathern's spinning roll is not spring pressed toward the core, but the pressure is applied by the hand of the operator. The State patent describes a spring but when the machine was operated for me at the Goodyear plant the spinning wheel either
30 was not spring pressed at all, or if at all, only to the extent of positioning the rolls, and the working pressure was applied as in the Mathern machine by the hand of the operator. I have pointed out that this difference between the machine and its operation as set forth in the State patent and the Goodyear machine and its operation was probably due to the fact that the State patent discloses a peculiar mode of operation by which the rolls operate in the bight of the fabric in view of a very high rotative speed whereas the Goodyear machines do not make use
40 of any such mode of operation but operate at a much

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lower speed after the ordinary method of hand spinning. The latter also is the mode of operation of the Belgian Mathern machine under consideration.

The spinning rolls of the Mathern patent shape the fabric to the core and stick it thereto in so far as it was not shaped by the preliminary stretching.

I call attention to the fact that the State machine is not safeguarded in any way to permit of automatic operation. Thus if the State machine were in the position shown in Fig. 2, and the feed wheel 124 were actuated automatically instead of by the hand of the workman, something would be smashed unless the operator remembered to grasp the handle 142 and so spread the wheels apart to permit the tire to enter between them. The Belgian patent provides for this contingency as I have pointed out by hooking the spinning tool over the journal pins 35 so that in case of the accident just mentioned, these tools would simply be lifted from their support and no harm could be done.

In my opinion this machine as fully disclosed in the Mathern Belgian patent comprises all of the elements and features necessary to a practical tire building machine in accordance with the previously well known hand method of building tires, where the State patent is not a clear disclosure of any machine suitable for carrying out either the old method of building a tire or realizing the peculiar mode of operation which the State patent seems to intend. The Mathern patent shows all of the features of the State machine except the spring pressure of the spinning rolls against the tire. Whatever may be said as to the special method of operation illustrated by Figs. 12 to 12c of the State patent, it would not seem that the spring pressure arrangement shown by State would be suitable for the ordinary method of building tires as practised by hand or with the Mathern machine or Goodyear machine.

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I observe that in describing the rolls 36 above, I pointed out the fact that the specification describes a pair of such conical gears on each side but I omitted to note the fact that the drawing shows only one on each side. These gears are not described as having any important or essential function but are merely auxiliary refinements. The unformed portion of the fabric will of course pucker since it is too long for the circumference to which it is to be applied. By putting in regular creases the patentee Mathern gave to the fabric a tendency to pucker uniformly. Whether, therefore, there be one of these rollers or two is merely an unessential incident without any important effect upon the results.

I have noticed that the Mathern patent does not show springs for pressing the spinning roller toward the core. In this respect it differs from the showing of the drawings of the State patent. State however states that he includes, broadly, pressure exerted by the hand of the operator as a laterally yielding force for actuating the spinning roll. I therefore understand that absence of the spring for pressing the spinning roll toward the core does not exclude the Belgian machine from the description of the State machine. It would only be the work of a mechanic to add a spring.

It would appear therefore that unless the State patent is to be limited to the peculiar mode of operation disclosed by reference to Figs. 12 to 12c it is merely such a machine as is clearly disclosed in Belgian patent 194,731 to Mathern.

Q. 32. Will you state whether or not this Belgian patent discloses substantially the method of operation which you saw followed by the machines at the Goodyear plant, already mentioned by you?

A. In my opinion it discloses exactly the mode of operation practised with the Goodyear machines. Thus in both the fabric is stretched into partial conformation

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with the core and the tread portion rolled into intimate contact therewith. In each the fabric is pressed against the core by heavy pressure applied to the spinning roll and is thereby conformed and stuck to the core. The only difference is that the Belgian patent automatically feeds the spinning roll radially inward while the Good-year machines were hand fed.

Q. 33. Does this Belgian patent disclose an open tire shoe making machine which has a power driven ring core, a radially moving support, and a spinning roll mounted on the support for passing radially along the sides of the tire shoe to shape the sheeted fabric on the core? 10

A. Yes.

Q. 34. Does it show the spinning roll as mounted at a receding angle to the plane of the core?

A. It does.

Q. 35. Does it show the spinning roll as having a rounded disk shaped working edge? 20

A. It does.

Q. 36. Does it show a pair of such spinning rolls so mounted for simultaneous operation on both sides of the tire?

A. Yes.

Q. 37. Does it make provision for yieldingly forcing these spinning rolls laterally toward the core?

A. Yes, the spinning rolls are pivoted to swing to and from the core and provided with handles for yieldingly pressing the spinning rolls against the core. These handles are shown in Fig. 6 placed down close to the spinning wheel so as to give a large leverage and enable a heavy pressure to be exerted. 30

Q. 38. Does it show slow speed mechanism for actuating the core when receiving fabric from the stock roll?

A. It does and expressly describes it for this purpose.

Q. 39. Does it show fast speed mechanisms for 40

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actuating the ring core during the operation of the spinning roll?

A. It does and describes it for this purpose.

Q. 40. Does it show speed changing mechanism for changing from the low speed to the high speed and the opposite?

A. It does.

Q. 41. Is the radially moving support which carries
10 the spinning roll, in the Belgian patent, a radially sliding support?

A. Yes, it is carried on a slide moving in guideways and is fed by a screw, as in the State patent, but in the Belgian machine the screw is fed automatically.

Q. 42. Have you read and do you understand U. S. Patent to Vincent No. 794,473 dated July 11, 1905?

A. Yes.

Mr. Seward: I offer in evidence copy of the said
20 Vincent Patent and ask that it be marked "Defendant's Exhibit J, Vincent Patent."

Q. 43. Will you please describe the machine disclosed in this patent and compare it with the machine of the State patent in suit?

A. The Vincent machine shown and described in the patent is intended for making the same sort of tire as is the State machine, and it comprises a stock roll and stretching mechanism for shaping the fabric as it is
30 drawn from the stock roll onto the core. It also comprises mechanism for sticking the fabric to the core as well as mechanism for the subsequent operations. It also has a power driven ring core. It differs however from the Mathern machine or the State machine in that it has only one speed. This is because it stretches the fabric so nearly to the final shape that spinning rolls are not necessary. Looking at Fig. 4, the machine comprises a stock roll 13 from which the fabric passes over a guide roll 15,
40 thence over a cylindrical tension roller 16 and thence

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over an oval shaped roller 17. The two latter are geared together and of such relative diameter as to stretch the fabric, and the specification states that it is stretched until the centre has a length equal to the circumference of the outer surface of the tire core while the edges have the circumference of the inner edge of the tire core. From the roller 17 the fabric passes to the core. This is revolved by a worm 6 and worm wheel 7 from the shaft 5 as seen in Figs. 1 and 2. The canvass thus goes on the core already stretched substantially in shape. To apply 10 it closely thereto a series of hammers is provided arranged to strike the fabric against the core, there being a succession of such hammers mounted progressively radially inward. These are power driven by shaft 22 as seen in Fig. 2 and operate to pat or hammer the fabric against the core. These hammers act progressively radially inward as the core with the fabric applied to it rotates, thus laying the fabric smoothly against the core with a progressive inward radial action. These hammers are 20 spring pressed toward the core, the mechanism acting merely to move them away and at the proper time allow the springs to actuate them against the core pinching the fabric against it. Thus the fabric is smoothly applied to and stuck to the core with a progressive inward radial motion as the core rotates.

Thus this Vincent machine has in a machine for making open belled tire casings, a stock roll or fabric supply, means for tensioning and stretching the fabric, a power driven ring core and radially acting means for 30 applying the fabric smoothly to the core.

Q. 44. Have you read and do you understand U. S. Patent to Seiberling and Stevens No. 762,561, dated June 14, 1904?

A. Yes.

Mr. Seward: I offer a copy of the Seiberling and Stevens Patent in evidence and request that it be marked "Defendant's Exhibit K, Seiberling and Stevens Patent."

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Q. 45. Will you kindly describe the machine disclosed in this patent and compare it with the machine of the State patent in suit?

A. The Seiberling and Stevens patent also shows a machine for the making of open belled tire casings. It comprises fabric tensioning means for fabric drawn from a source which the patent does not show. This tension-
10 ing mechanism is the group of mechanism seen in Fig. 1 bearing the group of reference numbers 39-49. The fabric is adjustably pinched between rollers 43, 46. A rotating ring core 8 is provided adjacent to the tension mechanism and the rotation of the core draws the fabric through the tension rolls and stretches it on the core as indicated by dotted lines in Fig. 1. A tread roller 17 with side
flanges 18 and power driven (as more fully shown in Fig 5) presses the stretched fabric over the tread por-
20 tion and the flanges 18 are held against the fabric by rollers 52 laterally spring pressed toward the core by spring 54, which press the fabric down against the side of the core.

The rotation of the core next carries the fabric between a pair of shaping or smoothing fingers 85 which have a radial reciprocating motion best seen by reference to Figs. 1 and 6. These reciprocating fingers act radially to shape and smooth the fabric radially inward and imitate the action of the "spade" sometimes used in the
30 hand building of tires for the same purpose. The fabric next passes between a pair of stitching rollers mounted at a receding angle as seen in Figs. 1 and 4, under control of the workman. These rollers 91 act to force the fabric into the crease at the extreme inner portion of the core as best seen in Fig. 4. The machine is also provided with bead placing means, very similar in general to that shown in the State patent in suit.

Like the State machine the Seiberling and Stevens
40 machine has a power driven ring core, a tensioning means

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for fabric drawn upon the core, a tread roller with spring pressed flanges for smoothing the fabric over the tread portion, also partly on the sides in the Seiberling and Stevens machine. This tread roller also constitutes, in the Seiberling and Stevens machine, the means of propelling the core and, as shown in Fig. 5, it may be driven at various speeds by sliding the gear 19 by means of the arm 21 provided for that purpose. Thus the machine 10 may, like the State machine, have a high and low speed drive. Also like the State machine, there are radially acting means for smoothing the fabric and shaping it to the core, these means consisting of radially acting smoothing fingers and radially acting stitching rollers. I note that, as shown in Figs. 1 and 6, the radially acting smoothing fingers are power pressed toward the core to pinch the fabric against the core.

I note that the stitching rolls are disk shaped wheels, 20 are arranged for simultaneous action on opposite sides of the tire, are radially movable with respect thereto, are arranged at a receding angle and are provided with means for pressing them laterally towards the core to act on the inner portions of the fabric after the tread roll has acted thereon.

Q. 46. Have you read and do you understand the U. S. Patent to Moore, No. 518,112, dated April 10, 1894?

A. Yes.

Mr. Seward: I offer in evidence printed copy of 30 the Moore patent and request that it be marked "Defendant's Exhibit L, Moore Patent."

Q. 47. Will you please describe the machine disclosed in the Moore patent and compare the same with the State patent in suit?

A. The Moore patent shows a machine for making open bellied tire casings which consists generally of a power driven ring core and a group of tools for acting 40

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upon the fabric conveniently arranged above the core to be selectively employed by the workman in forming the tire. These tools are mounted each upon a lever pivoted above the machine as seen in Figs. 1 and 2 and normally elevated by counterweights passing over a pulley.

Adjourned to Tuesday, June 17, 1919, 10.30 A. M.

10

NEW YORK, June 17, 1919, 10.30 A. M.

Met pursuant to adjournment.

Present: Parties as before.

EXAMINATION OF MR. WATERMAN CONTINUED:

The ring core is of peculiar construction having an ex-
pansible inner portion and a removable outer split rim 49
best seen in Fig. 3. This rim when removed from the ex-
20 pansible central part or spider may have its ends over-
lap so as to materially reduce its diameter. To form a tire
the specification says "a piece of lining fabric or material
having been made into the form of an endless ring by
means of cement or sewing is then put on the shell." The
central spider seen in Fig. 2 being suitably contracted, the
shell or tread portion is placed upon it and the spider ex-
panded by means shown in Fig. 1 so as to stretch tightly
the endless ring of lining material which has been applied
30 to it. In this manner the stretching operation is carried
out.

Endless wires or threads are then formed in the de-
pression on the rim, the fabric turned back and the laying
down accomplished with the spinning rolls 47 and 48,
the latter being sharper edged than the former so as to get
down into the bottom of the hollow.

The specification does not limit the use of the machine
to any one particular form of core, and it is obvious that
40 any of the forms now in use might be employed. The

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specification expressly states, page 2, line 107, that it may be "of any other desired and approved shape".

It is evident that this machine provides, in connection with a power driven core, an assemblage of tire makers tools above the core. Thus the rolls 701, 702 are for spreading and working the cement on the fabric. The roll 44 is a hollow pneumatic tread roller which conforms itself automatically and perfectly to the shape of the tire and removes the air bubbles while rolling the fabric into close contact with the core. The rolls 47 and 48 are spinning rolls, roll 47 having a thicker edge, that is, rounded on a larger radius, while the roller 48 is for working down at the extreme edges. These rollers are mounted so as to permit both radial and lateral movement with respect to the core. 10

In other words, this patent clearly discloses the idea of a power driven core and a mode of conveniently assembling any tire tools that the workman may happen to need for the particular shape of core and condition of fabric or cement. These tools are conveniently mounted so that all the workman has to do is to let go of them and they will automatically be raised out of his way while he grasps another tool. 20

As compared to the State machine, it is evident that the Moore machine has the means for mounting and dismounting the core, consisting of an expansible spider or chuck, and a demountable core, the whole constituting a rotatable ring core. Means is provided for driving it by power at what the patentee calls a high speed. Thus he says, page 3, line 73, 30

"The rotation is kept up at a high rate of speed during the performance of the operations which now are proceeded with."

There is also a tread roller for conforming the fabric to the tread portion of the core and spinning rollers for conforming it to the other portions, the fabric having been 40

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previously stretched to shape as just above stated. It is evident that this is a practical tire building arrangement which could be used for any shape of tire of the type here under consideration, so far as concerns the spinning of the fabric against the core to shape it and bring it into closer adhesion. It of course does not show the bead placing and trimming arrangements found in the Seiberling and Stevens, Vincent, Mathern and State patents. It can
10 hardly be said that the State patent is in any sense more automatic than is the Moore patent since in each case the stretching of the fabric on the core and its rotation is all that is done by the driving power, many elements of the machine being merely conveniently located tools appropriately grouped with reference to the rotating core and which the workman may use according to his discretion.

Q. 48. Have you read and do you understand U. S. Patent to Jeffery No. 607,245 dated July 12, 1898?

20 A. Yes.

Mr. Seward: I offer in evidence copy of the Jeffery patent and request that it be marked "Defendant's Exhibit M, Jeffery patent."

Q. 49. Will you please describe the construction shown in the Jeffery patent and compare it with the machine of the State patent in suit?

A. The Jeffery patent relates primarily to a tire and only incidentally describes the machine. The peculiarity
30 of the tire is that instead of being built substantially in the form it is desired to have when it is on the rim, Jeffery proposes to build it as a nearly flat band with suitable beaded edges to properly engage the rim on which it is to be used, as shown in Fig. 4. The tire is built by stretching bias cut fabric, rubber impregnated, on a revolving core wheel appropriately shaped as shown in Fig. 2, the core being mounted in suitable bearings to be revolved. The core has formed in it depressions A' and the fabric
40 after having been stretched on to the core is stretched or

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depressed into the grooves by the use of the wheels or rollers C which the specification says have a "dull knife-edge periphery". These rolls are mounted as seen in Figs. 1 and 2 so as to be movable radially toward the core and into the groove. By their action, the fabric is tucked into the groove and laterally stretched as described at page 1, line 67 and at page 2, line 70, also line 12. The specification says that a single wheel C as shown in Fig. 3, may be 10 employed, but that he prefers the double wheel arrangement "so that both wheels may be simultaneously pressed up against the wheel A as the latter revolves and the fabric stretched into both grooves at once" (p. 2, line 47). The patentee says that the advantage of this is that "the fabric is drawn both ways from the middle at once and is not stretched out of position as it might be if one line only were operated at a time" (p. 2, line 53).

As compared with the State patent the Jeffery patent 20 shows the idea of a revolving core on which the fabric is to be stretched and a conveniently mounted wheel for performing the necessary operation of working the fabric into place and into proper shape. In neither case is the operation automatic, the machines both being merely assemblages of tools rather than automatic machines in the ordinary sense.

Q. 50. Have you read and do you understand U. S. patent to Bayne and Subers No. 847,041, dated March 12, 1907? 30

A. Yes.

Mr. Seward: I offer in evidence copy of the Bayne and Subers patent and request that it be marked "Defendant's Exhibit N, Bayne and Subers Patent."

Q. 51. Will you please describe the machine shown in this Bayne and Subers patent and compare it with the machine of the State patent in suit?

A. The Bayne and Subers patent shows an automatic 40

Frank N. Waterman for Defendant—Direct.

machine for making cord tires as distinguished from fabric tires. It shows a rotatable ring core of substantially the shape used at the present time and rollers such as 19 arranged at a receding angle and automatically fed to lay the cords, previously saturated with rubber, firmly against the revolving core. There are three groups of these rollers for different portions of the tire surface namely, the rollers 19 and 36 as best seen in Fig. 4 and the rollers 50 as best seen in Fig. 5. These rollers are spring pressed against the core and are automatically fed as are, for example, the rollers of the Mathern machine which I have already described. The machine is shown provided with cranks 17 as a means of revolving the core, but the patentees state, page 2, line 15, that they do not intend to limit themselves to such a means.

It is clear that as regards the elements of a demountable rotatable ring core, power driven and radially fed rollers arranged at a receding angle and spring pressed against the core, to squeeze the threads between the rollers and the core, and to progress in regular fashion over its surface, the Bayne and Subers patent is such a machine as is shown in the State patent. Indeed, there is no apparent reason why by simply rotating the machine in the opposite direction so that the wheels 19 would progress radially from without inwards (instead of in the reverse direction as when laying on the cords) this machine would not readily spin the fabric of a fabric tire smoothly down against the core. In any event it clearly shows the idea of a revolving core and suitable tools in the form of spring pressed rolls arranged for operating upon the core as in the State patent. The machine appears to be a simple and practical structure for its intended purpose.

Mr. Seward: I offer in evidence copy of German patent to Mathern, No. 206,197, filed December 20, 1906, ausgegeben January 26, 1909; together with copy of certified translation of the same furnished by

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the United States Patent Office, with request that the patent and translation be marked collectively "Defendant's Exhibit O, Mathern German Patent."

It is stipulated between counsel that this translation may be received in evidence, subject to correction if error be found therein.

Q. 52. Have you read and do you understand Defendant's Exhibit O, Mathern German patent? 10

A. Yes.

Q. 53. Will you please describe the machine shown in this German patent and compare it with the machine shown in the State patent in suit?

A. The Mathern German patent shows a machine which in all of its major features is substantially the same as that which I have already described in considering the Belgian patent. The chief features of difference are that the German patent shows two conical gears 36 20 on each side through which the edges of the fabric pass as the fabric is drawn from the stock roll and stretched before being applied to the core. The Belgian patent describes two such gears but shows only one. The German patent rolls 30 are shown as spring pressed toward the core, by springs arranged against the arm spring 1 just as the springs 145 are arranged in Fig. 9 of the State patent. In addition, the German patent shows in Figs. 1 and 3 thereof, an arrangement of stepped spinning rolls 30 38 carried on arc shaped bar 29 arranged to be reciprocated to progressively smooth down the fabric and shape it clear to the inner side of the core in a single rotation instead of a number of revolutions as is necessary when a single pair of spinning rolls is employed. This arrangement of stepped spinning rolls appears to be an equivalent mode of operation intended to save time.

Mr. Seward: I offer in evidence copy of French patent, to Hernandez, No. 395,812, filed January 7, 40

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1908, granted January 8, 1909, published March 19, 1909, together with copy of translation of the same certified by U. S. Patent Office, and request that the patent and translation be collectively marked "Defendant's Exhibit P, Hernandez Patent."

10 It is stipulated between counsel that this translation may be received in evidence, subject to correction if error be found therein.

Q. 54. Have you read and do you understand Defendant's Exhibit P, Hernandez French patent?

A. Yes.

Q. 55. Will you please describe the machine shown in this French patent and compare it with the machine shown in the State patent in suit?

20 A. The Hernandez patent indicates by a series of detailed drawings a tire making machine arranged as diagrammatically indicated in Fig. 1. There is a power driven ring core *d* mounted for rotation as shown in Fig. 5. The arrangement of the supply roll and guide rollers *c1*, *c4*, *c5*, is shown at the right of Figs. 1 and 2. There is a tensioning means as indicated at *c3* as a brake band weighted to apply the tension.

30 The fabric is drawn off onto the core as indicated by the line *x* in Fig. 1 and as the core rotates, passes in front of a group of spinning rolls mounted upon a rotatable support *i*¹. This is driven by a separate belt as indicated at the left in Fig. 1. Each of these spinning rolls is a disk with round edge as seen in Fig. 6. There are a number of such spinning rolls spring pressed towards the core and although not actually shown in the drawing, the specification states that there is a similar arrangement to operate on the opposite side of the tire. As the core *d* rotates the support *i*¹ also rotates at a very much higher velocity, the rolls *i*¹ being carried successively
40 inward across the entire side of the fabric upon the core,

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thus shaping it and pressing it against the core. The arrangement is a very ingenious plan of making the shaping operation automatic.

There is also means for applying the bead and for shaping the fabric about it shown in detail in Fig. 7 and in operative relation at j^2 to j^3 in Figs. 1 and 2. The specification says that there is a duplicate set of these for the other side of the core.

10

It thus appears that this machine was to a very large extent an automatic machine for making tire casings of the sort referred to in the State patent and having a power driven ring core, a stock roll and tension devices co-operating therewith, and forming rolls laterally spring pressed toward the core, and arranged to move in a generally radial fashion inward over the fabric to press the latter against the core and to form and smooth it thereon.

20

Mr. Seward: I offer in evidence copy of U. S. Patent to Dewey, No. 438,407, dated October 14, 1890, with the request that it be marked "Defendant's Exhibit Q, Dewey Patent," also copy of U. S. Patent to Seymour No. 80836, dated August 11, 1868, with the request that it be marked "Defendant's Exhibit R, Early Seymour Patent"; also copy U. S. Patent to Seymour No. 376,167, dated January 10, 1888, with the request that it be marked "Defendant's Ex-

30

Q. 56. Have you read and do you understand the Dewey patent and the two Seymour patents just offered in evidence?

A. Yes.

Q. 57. Will you please describe the structures shown in these three patents and compare them with the disclosure of the State patent in suit?

A. The operation which I have referred to as spinning 40

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down the fabric to shape it and apply it to the side walls of the tire casing inside of the tread portion is merely an illustration or particular application of a well known mechanical process known as spinning. It is of course an entirely different use of the word "spinning" to that in which it is employed in textile work as referring to the forming of yarns.

- 10 The three patents just offered in evidence illustrate this mechanical operation of spinning as applied in machine shop practice. The Seymour patent 80836 and Dewey patent 438,407 illustrate the practice as applied to thin metals, while the Seymour patent 376,167 illustrates it as applied to heavy metals. The tool used in spinning metal in this manner is usually a wheel or roller and State was therefore merely using the terminology of the machine shop when he referred to his rollers 147 as "spinning rolls". As these patents clearly indicate,
- 20 the metal was spun over a form or core and gradually assumed the shape of that core as is very clearly shown in Figs. 2 and 3 of the Dewey patent 438,407. In this instance, the patent illustrates the work as done by hand; the core being rotated by power and the tool being guided by hand. This is probably merely because the invention which the Dewey patent more particularly sets forth, is a process of progressively annealing the metal as the spinning wheel advances over it. Both hand and
- 30 machine spinning were very old in the art long prior to the time of the State patent. The Seymour patent 80,836 which was entitled "Spinning Metals" shows an arrangement in which a tool consisting of a spinning wheel like the hand spinning wheel of the Dewey patent, is shown as mounted for actuation by mechanical means and spring pressed toward the work. This would be a more usual arrangement where much spinning was to be done. In this patent the spinning wheel *t* is mounted
- 40 in a manner analogous to the mounting of a lathe tool

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in a compound rest, there being guides *k* whose angle to the work can be changed by which the spinning tool may be moved in a direction in general parallel to the work. At the same time by means of the handle *w* the tool may be withdrawn from the work. The spring *d* may be adjusted by the screw and handle *v*. Thus, as the core revolves the workman turns the handle *p* and moves the spinning wheel over the work, the spring causing the tool 10 to conform to the varying outline thereof. The core shown in Fig. 1 at *c* is evidently of a shape such as might be used to spin up the canopy of a gas or electric light fixture.

The spinning operation requires a high speed and it was therefore only the obvious and natural thing for State in the patent in suit to suggest rotating the tire core at a high speed as that was the usual practice in spinning metal.

Looking at the Dewey patent for example, it will be 20 seen that a flat disk of metal *a* is inserted between the core or former *c* and the tailstock *a*. This is then revolved at high speed and the spinning wheel *d''* is pressed against the core pinching the metal to be spun between the two. As the spinning tool moves over the core the metal is shaped to the latter but the centrifugal force holds the unspun portion standing straight out. Perhaps Mr. Browne will refer to this holding out as the action of "invisible fingers". 30

The Seymour patent 376,167 shows a machine for automatically spinning heavy metal and shows in the machine shown in Fig. 1 the spinning of the air chamber of a pump. The operation being performed is the tapering and flanging of the cylindrical part D. This is rotated by power and as it rotates a pair of spinning rolls *h'* are automatically fed downward shaping the metal as indicated by dotted lines. The peculiarity of this instance of spinning is that it is not done over a 40

Frank N. Waterman for Defendant—Direct.

core, the metal itself being so heavy that the correct form may be given by merely correctly guiding the spinning roll, and this is done automatically by means of a guide-way *f* on which the tool carrying slide *g* moves, the feeding being automatic by means of the feed screws *E* driven by gears *E'*.

These patents will suffice to illustrate the fact that
 10 the spinning down of the fabric onto a tire core, as I understand was common in hand practice, was merely a particular application of a well known mechanical process and that State in adopting this spinning tool, merely complied with the well known practice in the art when he provided means for rotating the core at high speed during the spinning operation, and a hand fed mounting for the tool as in the early Seymour patent just referred to, as well as a spring for pressing the tool
 20 toward the work.

Adjourned to Thursday, June 19, 1919, at 10.30 A. M.

NEW YORK, June 19, 1919, 10.30 A. M.

Met pursuant to adjournment.

Present: Parties as before.

30 EXAMINATION OF MR. WATERMAN (CONTINUED):

Q. 58. You have referred to the hand spinning method of laying down fabric as having been seen by you several years ago. Will you briefly describe this operation?

A. The core was mounted on a stand so as to permit it to rotate, and means was provided for supporting the core in either a vertical or horizontal position. There was also a device which could be used to hold the core
 40 against rotation in one direction. The workman put this

Frank N. Waterman for Defendant—Direct.

last named device into operative position. He then took a piece of bias fabric impregnated with rubber and stuck one end to the core, the core having been previously coated with cement. He then threw the other end of the fabric over his shoulder and stretched the fabric circumferentially on the core for a distance of about a foot or a foot and a half, by pulling on it with his hands. He then rotated the core a short distance away from him and again stretched on another part of the fabric. This operation was repeated until the fabric strip had been completely stretched once around the core. The workman then disengaged the device for holding the core against rotation in one direction so as to permit the core to freely rotate. He then rotated the core and applied to the tread portion and a little way down the side a cylindrical metal roller in order to smooth the fabric where it had been stretched on the core and remove any air pockets. He then caused the core to rotate rapidly and, taking a hand stitcher, applied it to the side of the core at about the edge of the part of the fabric which was adhering to the core, and then moved the hand stitcher radially inwardly while the core was in motion, pressing the stitcher laterally against the core all the time. This operation spun down the fabric on one side of the core, and it was then repeated on the other side of the core. The hand stitcher used was a disk-like metallic wheel or roller having a rounded edge and about two or three inches in diameter. It was mounted to revolve in a wooden handle. I saw this operation about seven or eight years ago and it appeared to be a regular factory operation. It was strikingly similar to the method of operation which I have described as being followed in the use of the machines exhibited to me at the Goodyear factory.

Q. 59. Do you find in the State patent in suit any recognition of the prior method of hand spinning.

Frank N. Waterman for Defendant—Direct.

A. Yes, I note that on page 5, beginning at line 108, the specification of the State patent says, "The spinning-rolls are also shown as spring-pressed toward the plane of the ring-core by springs 145, here shown, diagrammatically, as leaf springs although, in practice, strong spiral springs will be used. These springs exert the pressure against the fabric for forming it against the sides of the
10 core which would be exerted by the arm of the workman in case of a hand-tool or a hand-pressed roll. In consequence, the work of these spring-pressed spinning-rolls is far more even and more rapid than in the case of a roll pressed against the core by hand". This seems to me to be a clear recognition of the hand-spinning of fabric on the core since it directly compares that method with the method followed by the State machine. I note further that the only difference which the patentee mentions as
20 existing between the hand method and the machine method is that in the latter work of the spinning-rolls is more even and more rapid.

Q. 60. Have you examined and seen in operation the Defendant's tire making machine which was exhibited to Plaintiff's experts, and referred to in the *prima facie* case herein?

A. Yes.

Mr. Seward: I offer the said machine in evidence
30 with the request that it be marked "Defendant's Exhibit T, Defendant's Machine".

Q. 61. Have you read and do you understand U. S. Patent to Thropp, Thropp & de Laski, No. 1,119,326, dated December 1, 1914, a copy of which is in evidence herein as Plaintiff's Exhibit No. 3, Patent on Defendant's Machine?

A. Yes.

Q. 62. Will you please describe the construction and
40 operation of the machine "Defendant's Exhibit T", and

Frank N. Waterman for Defendant—Direct.

compare it with the construction and operation of the machine set forth in the State patent in suit; making reference if you wish to the said patent Plaintiff's Exhibit No. 3?

A. Patent 1,119,326 discloses a tire building machine for making the outer casing for pneumatic tires. It comprises a rotatable core, means above the same for adjustably mounting a stock roll of fabric to be stretched on the core. It has means for exerting a regulated tension on the fabric to stretch it to shape. It has spinning rolls mounted to move radially and to be fed automatically to spin the fabric against the core. It is also provided with means for trimming the fabric and there is a bead placing means for use in locating the beads upon the core while the tire is being built up in the machine but this means is not an attached part of the machine.

Defendant's Exhibit T, Defendant's Machine, is such a machine as is shown in the patent just referred to, and has the same elements as just described. I shall therefore in describing the machine make use of the drawings of the patent 1,119,326, Plaintiff's Exhibit No. 3, to indicate the several parts of the machine.

The machine comprises a casing 1 which serves to support the bearings and all of the several working parts. To this casing there is attached a stanchion 41 carrying the stock roll and tension mechanism and also brackets 85 and 143 carrying the spinning roll mechanism and trimming knife mechanism respectively. The rotatable core 104 is mounted upon a shaft journaled in the casing 1 and is arranged by means of gears 10, 11, 13, 14, 12^x and 16 and clutches 19 and 20, all as best seen in Fig. 2, so that the core may be driven at either one of two speeds. The machine Exhibit T I found had a low speed of about 13 revolutions per minute and a high speed of about 130. The stanchion 41 has at the top a vertical guideway 43

Frank N. Waterman for Defendant—Direct.

in which a cross head member 61 is vertically adjustable by means of a hand wheel 60. This cross head member carries a pair of depending arms between which is mounted the stock roll 66 and the tension roll 68. On the shaft of the tension roll is a brake mechanism 72, 73 adjustable by a weight 74 movable on an arm 75. As this machine operates and as set forth in the patent, 10 Plaintiff's Exhibit 3, this tension mechanism is adjusted so as to stretch the fabric centrally, thereby largely conforming it to the core by the act of stretching. In order that this stretching may be effectively done, the position of the stock roll and tension roll with respect to the tire is adjusted by the hand wheel 60 so as to be as close to the core as is feasible without pinching the hand of the workman. The specification of the patent points out that, by virtue of this stretching, it is unnecessary to have 20 any tread roller to shape the fabric over the tread portion of the tire and the machine is accordingly not provided with such a tread roller or with any other means other than the stretching for shaping the fabric and laying it smoothly onto the tread portion. The specification lays **great stress** on this matter of stretching the fabric and refers to it a number of times. Thus at page 5, line 30, the specification says,

30 "As the shaft 8 is rotated, it will, in turn, rotate the core 104 drawing the friction-fabric off of the stock roll 66, and stretching the latter tightly about the periphery of the core 104. It will be seen that in preparing for this operation, the resistance on the roll 68 may be varied so as to get exactly the desired amount of stretching in the friction fabric on the periphery of the core; and that this stretch or tension will be exactly uniform throughout the circumference of the core, and may be much greater than that 40 possibly attained by the strongest operator."

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The same matter is referred to again on page 5, lines 62, 87, and 107, and again at page 6, lines 14, 96, and again at page 7, line 25, where it is said,

“We have found that the mechanism described for stretching the fabric on the periphery of the core is so efficacious that the necessity for having a roll for forming the fabric in this part of the core is obviated.”

10

It thus appears that the fundamental idea of means upon which the Thropp machine is built is that of stretching the fabric so greatly at its centre as to very largely effect thereby the shaping of the fabric to the core.

The mechanism for spinning the fabric down against the sides of the core to the inner edge is seen at the right in Fig. 1, mounted on a bracket 85, and as constructed on the machine Exhibit T, is seen more in detail in Fig. 14. I may say that the patent shows two arrangements, one in which the spinning wheels 132 are driven by independent electric motors so that their speed may be determined independently of the motion of the core, and the other the simpler arrangement shown in Fig. 14, in which the spinning wheels act in the usual way in spinning operations, namely, are driven by contact with the surface being spun.

Looking at Fig. 14, it will be seen that there are two spinning wheels 132 arranged to operate one on each side of the central plane of the core. These are mounted on arc shaped slides 122 adjustably mounted on arc shaped guides 97. These guides are given the form of the arc of a circle having the working edge of the spinning wheel as its centre and by shifting the slides 122 upon these guides, the workman changes the angle at which the wheels bear upon the core without changing the position thereof against the core.

The arc shaped guides 97 are pivotally mounted at 98 40

Frank N. Waterman for Defendant—Direct.

to swing toward and from the tire core like the jaws of a pincers. Each of these guides 97 has a rearwardly extending arm 108 arranged so that by means of a crank disk 111 and adjustable connecting rods 118 the two spinning rolls may be simultaneously adjusted toward or from the tire core by the manipulation of a hand wheel 117. If desired, however, the workman by loosening the connection 118 whereby the connecting rods 110 operate, may
10 free the control of the spinning rollers in this respect from the control of crank disk 111 and they will then automatically be pressed toward the core by weights 103 acting by means of cords 101 and pulleys 102, as seen in elevation in Fig. 5. By this means the spinning wheels are swung toward the core with a constant force no matter whether they are working on a part of the core of large diameter or a part of small diameter, and the fabric is
20 pinched against the core with uniform pressure at all points, thus the spinning wheels can automatically conform to the shape of the core so far as concerns their operation.

The spinning rolls and their mountings, as just described, are mounted on a traveling slide 85 traveling on the bracket 83. It is arranged so that the spinning rolls will be automatically fed radially inward by a sprocket and chain drive 92, 93, and gears 89, 90 and a clutch 94, 95. When this clutch is engaged the driving
30 connection is established and, the machine being in high speed gear, the spinning wheels are automatically moved radially toward the centre of the core. At the same time the weights automatically draw the wheels toward the core, so that the whole operation of spinning down the side is automatic, and the workman only has to shift the slide 122 appropriately to keep the spinning wheels acting perpendicularly to the surface of the fabric while pinching it against the core. If, however, the machine is
40 running in low speed, then the spinning rolls will not be

Frank N. Waterman for Defendant—Direct.

moved because they are driven only from the high speed gearing. Means are provided so that when the spinning wheel reaches the inner edge of the fabric or reaches the bead the automatic feed will be automatically discontinued and this point at which the feed shall cease to act may be selectively determined by the operator so that the spinning rolls will not displace the bead or come against a portion of the core where there is no fabric and 10 where an accident to the machine might result.

The machine is also arranged so that, at the pleasure of the workman, clutch 94 may be disengaged and the radial feeding of the spinning roll be done by hand. For example, in spinning the fabric down around the bead core 165, when the wheels are in the position shown in dotted lines in Fig. 14, the workman would disconnect the clutch 94 thus throwing out the automatic feed and would tighten the clamps 118 and then, by simultaneously 20 manipulating the hand wheels 88 and 117, he would cause the fabric to be smoothly applied around the bead cores 165 simultaneously.

The means for placing the bead in the machine are the same as those shown and described in the patent by reference to Figs. 10, 11, 12, and the mechanism for trimming is the same as that shown in Figs. 1, 8 and 9. As I do not understand, however, that these are of particular interest herein, I will omit description of them.

Briefly summarizing, the Defendant's machine is one 30 having and using means for stretching the fabric so as to largely shape it to the core and lay it so tightly thereon that no tread roller is necessary. The fabric is then pressed against the core all the way to the inner edges by spinning rollers operating substantially at right angles to the surface of the core at all points and not at a receding angle and the rollers are uniformly pressed against the core to pinch the fabric closely in contact therewith and are automatically fed radially inward. 40

Frank N. Waterman for Defendant—Direct.

I therefore find the defendant's machine Exhibit T is an automatic machine for carrying out in an automatic way the process which the workman would use in the hand building of tires and that it does not employ either the mechanism or the plan of operation which I understand is set forth and contemplated by the State patent. Thus, unlike the State patent as I understand it, Defendant's machine stretches the fabric on the core at such a
10 tension that it is conformed thereto and a tread roller is unnecessary. The spinning rolls do not act at a receding angle in a bend or bight in the fabric, but are pressed heavily against the core automatically through weight actuated mechanism and maintained at right angles to the core whereby the fabric is pinched against the core. It will thus be seen that the mode of operation shown in Figs. 12 to 12C of the State patent does not occur in the Thropp machine. Also I note that all of the mechanism
20 mounted on the table 85 at one side of the machine has to do with the spinning roll, that the bead placing mechanism is arranged concentric of the core and that the trimming mechanism is arranged at the left of the machine as seen in Fig. 1, and that these are not necessarily limited to successive action, but may be all simultaneously in co-operative position; and indeed in the use of the machine the spinning is done commonly on the outer layers of the fabric while the bead placing ring mechanism is still in
30 place. The spinning rolls and the bead placing mechanism thus co-operate to enable the fabric to be placed against the bead and the beads against the fabric with exact determination and maintenance of the proper relation so that the strains on the fabric involved in holding the beads are equalized with the beads in exact position and there is no tendency, therefore, to displace them. Thus a tire more symmetrical in its strain resisting properties is secured. How this may be done may be
40 easily seen from an examination of Figs. 10 and 11 of the

Frank N. Waterman for Defendant—Direct.

patent, Plaintiff's Exhibit No. 3. Also the defendant's machine does not employ the high speed provided in the State patent but uses a very much lower speed, namely, only about 130 revolutions per minute, instead of 207. The State patent sets forth the view of State that he has "discovered" that it is not only possible but highly desirable to operate by his plan at a "much higher speed say at 207 turns a minute", and that by so doing more work and better work is done. It is apparently upon this discovery that the very lightly stretched fabric indicated in Fig. 12 10 is shaped by rollers acting in the bight as shown in Figs. 12B and 12C. Defendant's machine, as I understand it, does not utilize this discovery but operates by pinching the fabric against the core as was done in hand building except that the spinning roll is kept at right angles to the core, as stated in the specification of the patent 1,119,326, page 6, line 108. It operates, therefore, at a lower speed and in a different manner. It would, I believe, be wholly erroneous to say that the fabric is in any way stretched 20 radially by the action of invisible fingers or that the rollers act in the bight of the fabric so formed.

Q. 63. Do you find any justification in the State patent in suit for the statement made by plaintiff's expert Browne when describing the patent in suit, which statement is as follows:

"The core is rotated slowly by power until a single layer of fabric has been passed completely around it. Then the core is stopped and the canvas is severed 30 by the workman who fastens the last end of the canvas so as to slightly overlies the leading edge, the rubber compound with which the canvas is provided ensuring the adhesion of these overlying ends.

At this stage the fabric is stretched at its middle so as to conform to the tread zone of the core and its margins or skirt portions are unattached and are no longer flat, but are in a loose, baggy condition."

Frank N. Waterman for Defendant—Direct.

A. I do not. The State patent contains no statement which would of itself seem to convey any such meaning, while, on the contrary, Figs. 12 and 12A show the fabric as not "stretched so as to conform to the tread zone of the core", but as shaped thereto by the tread roller, and the specification of the patent states that these figures show "the fabric in different stages of application" (page 2, line 45). It also expressly says that the tread roller is a "tread forming" roller and that its action is "to shape and smooth the tread portion of the fabric against the outer periphery of the ring core" (page 6, lines 122, 87 and 60). It seems to me, therefore, that Mr. Browne is mistaken and that there is no warrant in the State patent for assuming that the State machine operates or is intended to operate in the way that he describes. State in the very early part of his specification seems to set forth a discovery of his own as to a mechanism operating at "a much higher speed", and by virtue of this speed acting on the fabric in a way which he is at pains to illustrate by a series of four figures which contradict Mr. Browne's assumption.

Q. 64. I call your attention to the evidence of Mr. Browne with respect to the alleged result of circumferential and radial stretching which he imputes to the State method of operation; and particularly to his assertion as to the change in shape of the interstices of the fabric so that the said interstices are diamond shaped on the periphery with the long dimension parallel to the periphery and are diamond shaped on the sides with the long dimension lying radially. This testimony he illustrates by means of diagrams entitled "Original flat fabric before shaping" and "Fabric shaped to Core"? What have you to say as to whether or not that phenomenon results in the operation of the defendant's machine, Exhibit T?

A. Certainly not always, and so far as I have any information it does not at all. Of course an elongation

Frank N. Waterman for Defendant—Direct.

of the mesh where the fabric is stretched over the tread portion is inevitable as a result of the stretching, but I have never seen or been able to ascertain from anyone else that there is any distortion of the fabric meshes on the sides into diamonds having the longest dimension radial. I have carefully examined the fabric after being fully applied to the core by defendant's machine, but have not been able to detect any such action with the aid of a magnifier intended for examining the fabric and with a focal length of a little over one inch. This glass shows the elongation of the meshes on the tread due to stretching, but it does not show any radial elongation at any portion of the fabric.

Q. 65. In the operation of defendant's machine, are troublesome longitudinal wrinkles or creases formed in the fabric while it is being drawn on the core which must be gotten rid of by a tread roller or otherwise, as stated in the State patent in suit?

A. They are not.

Q. 66. In the defendant's machine, are the core and spinning rolls, and connected parts, constructed and coordinated for shaping and applying a previously unshaped sheet fabric strip to that part of the core beyond the tread portion?

A. I would not say so. The fabric is certainly very largely shaped by the stretching process before it is applied to the core.

Q. 67. In the Defendant's Machine, do the spinning rolls, in their radial movement act upon the centrifugally thrown out fabric?

A. I do not understand that language as properly describing the operation of the defendant's machine. The rollers in defendant's machine act against the core to pinch the fabric between their edges and the core. Of course in moving radially inward while acting at right angles to the surface of the core, they act to draw in

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Frank N. Waterman for Defendant—Direct.

the fabric which has not been previously applied, but there is no action directly upon the centrifugally held out fabric by acting in the bight, as shown in the State patent. The action is, on the other hand, against the core, as in hand spinning

10 Q. 68. In the machine of the State patent in suit, is the spinning roll support mechanically mounted to ensure its radial movement with a gradual advance in proper relation to the fast rotating core?

A. It is not. On the contrary, if in the operation of the State machine there is ever a gradual advance in proper relation to the rotating core, it is in spite of lack of any such means in the machine, and solely due to skill and judgment on the part of the operator, for there is no mechanism in the machine for ensuring any advance whatever, certainly none for ensuring that advance in proper relation to the rotating core.

20 Q. 69. I meant to ask you one more question with regard to the machine of the Belgian patent, and will ask it now: Will you state whether or not that machine operates to apply the fabric to the core if the action of the reciprocating rollers 30 be entirely omitted?

A. Yes, the machine operated satisfactorily with the action of the rollers 30 omitted, the fabric being properly stretched on the core.

30 Mr. Seward: I offer in evidence certified copy of the File Wrapper and Contents of the State patent in suit, with the request that it be marked "Defendant's Exhibit U, State File Wrapper."

Adjourned to Tuesday, July 8, at 10.30 A. M.

Frank N. Waterman for Defendant—Direct.

NEW YORK, July 8, 1919, 10.30 A. M.

Met pursuant to adjournment.

Present: Parties as before.

EXAMINATION OF MR. WATERMAN CONTINUED:

Q. 70. Did you examine last week, on July 2nd, Plaintiff's Exhibit No. 2, State Machine? If yes, will you 10 please describe the gearing arrangement for producing the high and low speeds of the core, and compare the same briefly with the gearing shown in State's patent in suit?

A. I did. The machine in general form and arrangement was similar to that shown in the State patent, the only notable differences being in the gearing. Referring to Figures 3, 4 and 5 of the State patent, I will use the reference numerals thereon to designate the several parts 20 to which I shall refer. The core shaft 90 is geared to the clutch shaft 70 by a pair of gears 88, 89, having respectively 58 and 30 teeth, the arrangement being substantially as shown in Figure 5. In the Machine Exhibit No. 2 there are reduction gear arrangements corresponding to 75, 76 and 82, 83 in position but the gears are not the same either in construction or function. Thus the members corresponding to the worm 76 and worm wheel 75 are in Exhibit No. 2, a pair of spiral gears which furnish the high speed drive instead of the low speed 30 drive as Mr. Browne interprets the State patent. The centre distances of these gears appear to be $5 \frac{1}{4}$ inches and there are 20 teeth on the gear occupying the position of the worm 76 and 32 teeth on the gear occupying the position of the worm gear 75, giving a ratio of speed reduction of 1.6 instead of a step up ratio of 1 to 1.15, as required by Mr. Browne's interpretation of the State patent.

Conversely, the worm 82 and worm wheel 83, instead 40

Frank N. Waterman for Defendant—Direct.

of being a high speed drive, as assumed by Mr. Browne, constitute the low speed drive, the worm being a single thread worm, and the wheel having 38 teeth, giving a speed reduction of 1 to 38.

10 The sprocket and chain mechanism corresponding to 79-80 of Figure 3 of the patent drives the slow speed shaft of Exhibit No. 2 at a lower speed than the high speed shaft, the ratio apparently being 3 to 2, there being 24 teeth on the large sprocket and 16 on the small sprocket.

20 Thus it appears that the high speed shaft of Exhibit No. 2 is that directly driven from the power shaft instead of that indirectly driven as in Mr. Browne's interpretation of the State patent. The low speed shaft 78 is driven at a reduced rate from the high speed shaft instead of the reverse as in Mr. Browne's interpretation of the patent and for the high speed drive the worm and worm wheel have been replaced by a pair of spiral gears.

The supporting arms for the spinning wheels are pressed toward the core by a pair of spiral compression springs instead of by the leaf springs 145 shown in Figure 9 of the State patent.

Q. 71. Will you state whether or not there were any name plates on the machine, and, if yes, recite their inscription?

30 A. There were two name plates on the machine. One said "Manufactured by The Goodyear Tire & Rubber Company, Akron, Ohio, U. S. A. patented June 14, 1904, patented November 30, 1909"; the corner of this name plate was broken but there appeared the following "ial No. 1" which I assume was originally "Serial No. 1".

The other name plate said "Machine No. 80-46 The Goodyear Tire & Rubber Co. Akron, O."

Q. 72. Will you state whether you took the high and low rotative speeds of the core, and if yes, what they
40 were?

Frank N. Waterman for Defendant—Direct.

A. The low speed was about 6 1/2 R.P.M. and the high speed about 230 R.P.M., under the conditions of power supply existing at that time.

Q. 73. Did you see a layer of fabric spun down on the core while rotating at about the high speed you have just mentioned? Did you find a part of this layer smoothly applied to the core; and did you examine the threads in the smoothly applied part to observe their relative angularity? If your answer to the foregoing is affirmative, will you briefly describe the relative angularity of the threads of the fabric, having in mind Mr. Browne's description of this matter given in his direct testimony? 10

A I did. The meshes of the fabric on the tread portion were apparently of lozenge or diamond shape with the long axis circumferential, that is in the rolling plane of the tire. The meshes at a certain mean radius appeared to be square and in the portions of smaller radius the meshes appeared to have taken a diamond shape with the long axis radial. The change of form was slight but perceptible. 20

Mr. Seward: Defendant's expert has not been given a demonstration of Plaintiff's Exhibit No. 2 State Machine, in the operation of building a tire carcass for the purpose of his testimony in this case.

Direct-examination closed.

30

Mr. Rogers: Plaintiff's Counsel inquires if it is understood that Mr. Waterman will be produced for further cross-examination, if requested by Plaintiff's Counsel, in connection with the Mathern Belgian patent, Defendant's Exhibit F; the Mathern German patent, Defendant's Exhibit O; and the Machine of Mathern Belgian patent, Defendant's Exhibit H, at a later period after October 15, 1919, and before Plaintiff begins his rebuttal evidence. 40

Frank N. Waterman for Defendant—Direct.

Mr. Seward: It is so understood; with the further understanding that Counsel for plaintiff shall now proceed with such cross-examination as he may wish to have concerning the remainder of Mr. Waterman's direct testimony.

Mr. Rogers: Upon the understanding as stated, Plaintiff's Counsel waives other cross-examination.

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Signature waived.

Notary's certificate waived.

Adjourned to a time and place to be agreed upon, the date being not earlier than October 15, 1919.

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Thomas A. Walch for Defendant—Direct.

UNITED STATES DISTRICT COURT,
DISTRICT OF NEW JERSEY.

FRANK A. SEIBERLING,
Plaintiff,

vs.

THE JOHN E. THROPP'S SONS Co.,
Defendant.

Equity No. 614

10

Defendant's Testimony.

Testimony taken on behalf of Defendant before EDWARD O'BYRNE, Special Master, at the office of the Clerk, United States District Court, Trenton, New Jersey, beginning on Friday, June 27th, 1919, at 11:00 A. M., 20 pursuant to notice and agreement of counsel.

APPEARANCES.

ROBERT FLETCHER ROBERTS, Esq., and
LUTHER E. MORRISON, Esq.
for Plaintiff.

E. CLARKSON SEWARD, Esq.
for Defendant.

THOMAS A. WALCH a witness called in behalf of De- 30
fendant, being duly sworn, testifies as follows:

DIRECT-EXAMINATION BY MR. SEWARD:

Q. 1. Please state your name, residence, occupation?

A. Thomas A. Walch, Trenton, N. J.; Foreman of the Tire Manufacturing Department of Ajax Rubber Company of Trenton, New Jersey.

Q. 2. How long have you been with the Ajax Company?

A. Thirteen years.

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Thomas A. Walch for Defendant—Direct.

Q. 3. Where was the Ajax Company located when you first went with it?

A. 106th Street, New York; East River between First Avenue and the River.

Q. 4. What year was that?

A. 1906.

Q. 5. What kind of work did you do with the Ajax
10 Company in 1906?

A. Made tires by hand.

Q. 6. Please describe how you applied the fabric to the core, telling us how the core was mounted and the operations you went through?

A. Well, we had three and four prong spiders; we would have a slot in the core and we would put it on this spider; then we had a wrench to tighten it up with screws on the top—adjustable screws; you could turn it until
20 you got it tight enough; then we mounted the core and put a little cement across the top and all around the side, about half way of the core; then we started our fabric and started to pull it on just as hard as we could, cut it off and spliced it; and then we would start and turn our core around just as fast as we could, and then we would take this stitcher, three inch stitcher they called it, a steel stitcher, about a sixteenth of an inch on the point, and we would go right in like that (indicating)
30 toward the bead and the same on the other side.

Q. 7. When you say "the same on the other side", do you mean on the other side of the core?

A. Yes.

Q. 8. Did you hold the stitcher in one hand or in two hands?

A. Two hands.

Q. 9. What position did the edges of the fabric take when you turned the core as fast as you could?

A. Well, it stuck out, just like that (indicating) laid
40 out.

Thomas A. Walch for Defendant—Cross.

Q. 10. Did you do this yourself?

A. Yes, sir.

Q. 11. Are you sure it was in 1906?

A. 1906.

Q. 12. You said the Ajax Company is now in Trenton; when did it come to Trenton?

A. 1906. I came to Trenton October, 1906, but I was one of the first ones to come; there was only half 10 of the company came then, but I was one of eight that came over here.

Q. 13. You started working for the Ajax in Trenton in October, 1906?

A. Yes.

Q. 14. Coming from New York?

A. Yes, sir.

Q. 15. State whether or not you continued the operation you have just described after you came to Trenton? 20

A. Yes; I continued it all the time after we came to Trenton. I was making tires for five years and always done it that way, by hand.

Q. 16. Did you see any other men following this same operation when you were in New York?

A. Oh, yes; several of them.

Q. 17. Did you see any others in Trenton?

A. Oh, yes; most all of them in Trenton.

Q. 18. How long have you been foreman of the Tire Making Department of the Ajax Company? 30

A. Eight years.

Mr. Seward. Direct examination closed.

CROSS-EXAMINATION BY MR. ROGERS.

x-Q. 19. You say that several of the employees of the Ajax Company in New York followed the same method of making tires that you did, namely the one that you have described?

A. Yes, sir.

Thomas A. Walsh for Defendant—Cross.

x-Q. 20. What other method of making tires by hand was used by the Ajax Company in New York?

A. Well, some of them, when they first started, would use a spade, a wooden spade.

x-Q. 21. Did they spin the fabric down on the core in the way that you did it?

A. No, not with the wooden spade; you had to have it stationary; went all around it and took much longer
10 to do it.

x-Q. 22. Most of the men did it?

A. Yes, sir.

x-Q. 23. With the spade?

A. No; with the stitcher.

x-Q. 24. Well, with spade or stitcher?

A. Well, the new fellows that would start in, they would always do it with the spade starting in, because it was quite a knack to do it with the stitcher. We
20 learned a lot of new men there and they did not quite get the knack of doing it right away.

x-Q. 25. When they used the spade in the manner described, the spade was worked in and out?

A. Yes, like that (indicating).

x-Q. 26. Somewhat in the manner shown in the sketch I show you, Plaintiff's Exhibit No. 7.

A. Yes; like that (indicating).

x-Q. 27. I suppose the quality of tires and their durability has materially improved in the last thirteen years,
30 has it not? I am speaking of fabric tires, not cord tires.

A. Well, we use the same kind of fabric, very near the same kind of compound. I don't know as they have durability any better. I believe the hand made tire was considered just as good as far as durability goes as a machine made tire.

x-Q. 28. Did they get as good mileage out of these hand made tires in 1906 as they do out of machine made tires today?

40 A. Yes, sir.

Thomas A. Walch for Defendant—Cross.

x-Q. 29. What mileage did they get out of a hand made tire in 1906?

A. Well, they were guaranteed five thousand miles.

x-Q. 30. Even in 1906?

A. 1906, yes, the same as they are today.

x-Q. 31. How many tires a day could you make by the spinning method which you employed? I am speaking of you personally.

10

A. Well, it depends upon the size of the tire. The three inch tires we would make probably eight in ten hours and the four inch tires we would do five in ten hours; four and a half and five inch, why we would do, well, three and four sometimes. It depends on the man himself. Of course there were fast and slow men, but the one that used the stitcher was the fastest.

x-Q. 32. How does the Ajax Company make its tires today?

A. Well, by hand and machine both. They make all cord tires by hand and the fabric tires by machine.

20

x-Q. 33. What machine does the Ajax Company employ for the making of fabric tires?

A. The Thropp machine.

x-Q. 34. While you were spinning down the fabric on the side of the core, under the hand spinning method, did the core ever stop rotating?

A. Oh, yes; once in a while you would have to start it up again.

30

x-Q. 35. I suppose that depended to some extent on the speed that you originally gave to the core?

A. Yes, sir.

x-Q. 36. And I suppose also to some extent on the amount of pressure you applied to the side of the core?

A. Yes, sir.

x-Q. 37. Have you any idea how great that pressure was with which you applied the stitcher to the side of the core?

40

Thomas A. Walch for Defendant—Cross.

A. Well, it was not a great pressure—just enough to stick the fabric to the cement; there was some on the inside, just to touch the fabric, very little pressure.

x-Q. 38. I suppose if you applied a higher degree of pressure there was a liability that the stitcher would slip?

10 A. Yes; you had to gauge your stitcher; that is, guide it very good.

x-Q. 39. I suppose that sometimes when the stitcher struck the splice or overlapped end of the ply, that it jumped.

A. Well, very little. You would have hold of it with your two hands to guide it very good, and your laps go up like that (indicating) and it could not move anyway.

x-Q. 40. Well, it did jump sometimes?

20 A. Well, sometimes, when it would strike a splice, but it did not jump far enough to do any harm.

x-Q. 41. What would you do when these occasional jumps occurred?

A. Well, we would make the tire just the same; it would be stuck just the same; I just held the stitcher and let it go right on.

x-Q. 42. You say the pressure which you employed was a very light pressure?

30 A. Well, yes, not to amount to anything; you had to hold the stitcher steady; that is the way you held it, the pressure, you didn't have to put on much pressure at all.

x-Q. 43. You said the fabric stuck out. I suppose you mean by that that the skirts of the fabric stood out from the sides of the core because of the centrifugal force; is that what you mean?

A. Yes.

x-Q. 44. Did it stand out to the same extent as it does in the machine that you are now employing?

40 A. Yes. Still the machines now, sometimes they will tuck it; it don't have to stand out.

Thomas A. Walch for Defendant—Cross.

x-Q. 45. Have you any idea how fast the core rotated when you were making tires by hand?

A. Well, no; I have no idea.

x-Q. 46. I suppose the amount of fabric that would stick out depended more or less upon the speed of the core, didn't it?

A. Yes, sir.

x-Q. 47. Did you ever try to spin both sides of the layer, ply, down at one time? 10

A. Oh, no; you would have to have two stitchers, you could not hold it.

x-Q. 48. You never tried to spin a tire with two stitchers, one on each side?

A. No. I am talking about hand spinning operation.

x-Q. 49. What percentage of stretch does the Ajax Company now use in applying the layer originally to the core?

A. Six per cent.

x-Q. 50. And what was the corresponding percentage of stretch when you made tires by the hand spinning method? 20

A. Six per cent.

x-Q. 51. Are you aware that tires are made with a considerably higher amount of stretch than that—I am talking about other companies.

A. I have heard that they do, but I have not worked at it in factories, only the Ajax for the last thirteen years.

x-Q. 52. In other words your experience is confined entirely to the Ajax practice? 30

A. Yes, sir.

x-Q. 53. Do you think the speed of rotation that you gave the core by hand was as great as that now present in the operation of the Thropp machine? Do you understand the question?

A. Yes. Well, it is very near the same; there was not much difference; you can twist the core just as fast as the Thropp machine. 40

Thomas A. Walch for Defendant—Cross.

x-Q. 54. As I understand it, the speed of the core when you were spinning by hand depended on the way you originally spun the core?

A. Yes, sir.

x-Q. 55. And of course that original speed of rotation grew less and less and less?

A. Yes.

10 x-Q. 56. Now, what did you mean in saying that you thought the speed of rotation at that time was practically the same as that of the Thropp machine now; do you mean that the original speed of the core was the same or the final speed?

A. When you would start it off; of course, it would die out a little. Of course, if you did not get both sides down, why you would have to start up again.

20 x-Q. 57. You did not spin the core while you were holding the stitcher against the side of it?

A. No; no.

x-Q. 58. In other words, when the core died down you would spin it again and then start over again with the stitcher?

A. Yes, sir.

x-Q. 59. Will you kindly explain what you meant by tucking the fabric, in answering x-Q. 44?

A. Well, some men tuck it in and others let it stand out; just as they feel like doing; it makes no difference.

30 x-Q. 60. How do they tuck it in?

A. Just push it with their hand like that (indicating) before they start up the machine.

x-Q. 61. You mean that when the skirt started to flare out, the operator would force it in?

A. On the machine, before they put the stitchers on; some operators let the skirts flare out and others tuck it down on the sides of the core with their hands before the core is speeded up.

40 x-Q. 62. And then I understand you mean that when

Talcut I. Curtis for Defendant—Direct.

the fabric has been tucked in in this manner, and the core is started to rotate, that it will not fly up?

A. No, sir; it won't fly up.

Mr. Seward: No redirect-examination.

Deposition closed.

Signature waived.

TALCUT I. CURTIS, a witness called on behalf of the 10 Defendant, being duly sworn, testifies as follows:

DIRECT-EXAMINATION BY MR. SEWARD:

Q. 1. Please state your name, residence, and occupation.

A. Talcut I. Curtis, Trenton, New Jersey; demonstrator of the Thropp tire machinery and equipment.

Q. 2. You are employed by the Delaski & Thropp Circular Woven Tire Company of Trenton?

A. Yes.

20

Q. 3. When were you first employed by that concern?

A. 1905.

Q. 4. What did you do for that concern in 1905?

A. Made tires for them.

Q. 5. Made them by hand?

A. Yes.

Q. 6. Just describe how you put the fabric on the core in making those tires in 1905.

A. We mounted the core on a three pronged spider stand, cemented the core, stretched the fabric on, spliced it, and then rolled it down with a three inch stitcher, rolling stitcher.

Q. 7. State just how you operated when you rolled it down; just describe what you did.

A. The rolling down I did in two ways; First, holding the stitcher with both hands, by rotating the core first, holding the stitcher with both hands, going down one side and then down the other side.

40

Talcott I. Curtis for Defendant—Direct.

Q. 8. When you say "down", in which direction do you mean?

A. Toward the center of the core; toward the inside circumference.

Q. 9. What was the other way in which you rolled it down?

10 A. The other method was in revolving the core with the left hand and stitching down with the right, turning the core from the other side—spinning it down.

Q. 10. In the second method, as I understand you, you rotated the core with the left hand?

A. Yes.

Q. 11. At the same time that you held the stitcher in with the right hand; is that correct?

A. Yes, that is correct.

20 Q. 12. How did you rotate the core in this first method?

A. Why, start the core rotating and get it up to speed, and then hold the stitcher with both hands and go down and right along.

Q. 13. When the core was rotating in the first method what position did the edges of the fabric take?

A. The edges flared out to a certain extent according to the swiftness of the core.

30 Q. 14. You mean by "swiftness" speed of rotation?

A. Yes; according to the speed of the core.

Q. 15. Did you ever follow that first method in any other factory?

A. Yes.

Q. 16. Where did you first do it after 1905 with the Delaski & Thropp Company?

A. I did it at the Empire Plant, Trenton, New Jersey.

Q. 17. What year?

40 A. I think that was 1906.

Talent I. Curtis for Defendant—Direct.

Q. 18. What position did you hold in the Empire then?

A. I was building tires at the time.

Q. 19. Did you subsequently hold any other position there?

A. Yes, sir; I was foreman afterwards.

Q. 20. When did you leave the Empire?

A. I left the Empire in May, 1909.

Q. 21. Then where did you go?

A. I went with the Batavia Rubber Company, Batavia,
New York. 10

Q. 22. Did you make any tires there?

A. Yes.

Q. 23. How did you put the fabric on the core at the Batavia Company when you first went there?

A. By the same method.

Q. 24. Do you mean by the first method mentioned by you?

A. Well, both ways I mean. 20

Q. 25. In what year did you do that at the Batavia Company?

A. 1909, and 1910.

Q. 26. You came back to the Delaski & Thropp Circular Woven Tire Company about when?

A. About the first of the year, 1911.

Q. 27. And have been with that company ever since?

A. Yes.

Q. 28. When you state that you are a demonstrator 30 of the Thropp equipment, do you mean of their tire machinery?

A. All of their tire equipment.

Q. 29. Just state what positions you have held in different tire factories.

A. The position at the Empire when I left there, I was foreman, and I was inspector at the Batavia Rubber Company when I left there.

Mr. Seward: Direct examination closed.

40

Talent I. Curtis for Defendant—Cross.

CROSS-EXAMINATION BY MR. ROGERS:

x-Q. 30. I understand that you demonstrate the Thropp Tire making machines; is that correct?

A. Yes. I break men in to run the machine in new factories when they put the machine in.

x-Q. 31. When was it that you first made tires by the hand spinning method?

10 A. In 1905.

x-Q. 32. How do you fix that date?

A. Because that is the time that I worked for the Thropp Company making tires.

x-Q. 33. Was that the only method you had employed in tire making by hand?

A. No, sir; I have used the spades also—the wooden spades.

x-Q. 34. Was that before or after you used the hand spinning method?

20 A. Well, I used, sometimes the spade at that time. We used them both possibly at that time, some. Some fabric is stiffer than others and so on, and they changed over to the other methods possibly a little.

x-Q. 35. When you speak about the spade method I take it you refer to a method which is illustrated, so far as the path of the tool is concerned, in plaintiff's exhibit number seven?

A. Yes.

30 x-Q. 36. Referring again to this plaintiff's exhibit number seven, did you ever use a stitcher instead of a spade in the same way?

A. No; I never used anything but the spade in this way.

x-Q. 37. What kind of fabric did you use the spade on in the saw-tooth method illustrated in this exhibit number seven?

A. We used a spade at the Thropp Company for the 40 circular woven fabric.

Talcott I. Curtis for Defendant—Cross.

x-Q. 38. When was that?

A. That was in 1905.

x-Q. 39. Will you kindly explain what kind of fabric you used the saw tooth method on at that time?

A. In connection with a circular woven band. This fabric was cut off in suitable lengths and joined together at its ends to make an endless band. When I say "circular woven fabric" I mean one in which the inner warps were shorter than those at the outer periphery, thereby tending to give the fabric normally a circular shape. 10

x-Q. 40. Was this the first tire making that you did?

A. At Thropps was the first, yes.

x-Q. 41. Was the first hand tire making that you did in connection with this circular fabric that you have been describing?

A. That was my first tire building.

x-Q. 42. How long did you work in that way?

A. I was at Thropps from about Spring to the late fall of 1905, and during that time I worked on these tires all the time. 20

x-Q. 43. And then where did you go?

A. I went to the Globe—the United & Globe Rubber Company's plant at Trenton.

x-Q. 44. Did you make tires there?

A. I did not make tires there.

x-Q. 45. How long did you remain in that position?

A. I think I was there until the spring of 1906 and then I went with the Empire people on tires again. 30

x-Q. 46. How long did you stay with the Empire Company?

A. I left there May 29th, 1909—about three years I was there.

x-Q. 47. And when did you first make a tire by the hand spinning method that you originally described?

A. I first made a tire spinning the fabric down at Thropps during the year 1905. 40

Talent I. Curtis for Defendant—Cross.

x-Q. 48. Perhaps I misunderstand you. Did you not say that during 1905 period with Thropp's you worked on circular woven stuff?

A. I did, but we made these tires, quite a few of them, putting on a ply of regular fabric instead of this circular weave for some tires, and those are the tires that I used the spinning method on.

10 x-Q. 49. Then, when you originally used the spinning method it was only on certain plies of the tire, is that correct?

A. Yes, the band ply.

x-Q. 50. The band ply?

A. The first that goes on the core.

x-Q. 51. In other words you merely laid down the first ply by the spinning method and then subsequently used the circular woven plies?

20 A. Placed the circular woven over that and spaded that down.

x-Q. 52. When did you first make a tire entirely by the hand spinning method, I mean, wherein all of the plies were spun down?

A. At the Empire.

x-Q. 53. And when was that?

A. That was between the Spring of 1906 and 1909 when I left there, mostly during 1906. After that time I was foreman and I did not build any tires myself personally.

30 x-Q. 54. Was that the general practice of the Empire Company?

A. Yes.

x-Q. 55. They made all of their tires by the hand spinning method?

A. Some of them, not all of them. Some of the men could not spin it down and used the spade all the way through—some of them.

40 x-Q. 56. Why could they not spin it down?

Talent I. Curtis for Defendant—Cross.

A. Well, they had not got used to it,—new men, mostly—had not got to be expert tire makers enough so as to do it.

x-Q. 57. You heard the testimony of Mr. Walch, did you not?

A. Yes, sir.

x-Q. 58. I refer to the witness who testified immediately before you. 10

A. Yes, sir.

x-Q. 59. Do you disagree with him in any of the statements that he made? Of course I am not asking you as to statements of fact?

A. No, I think not.

x-Q. 60. Did you ever try to spin down a tire on both sides of the core at one time by using two stitchers?

A. Not by hand, no.

x-Q. 61. What about the amount of pressure that you 20 applied in holding the stitcher against the core; have you any way of estimating the amount?

A. Not exactly, no; just used enough to roll the fabric smooth.

x-Q. 62. You think it was uniform on both sides of the core?

A. Yes.

x-Q. 63. I suppose making tires by a machine such as the Thropp machine is considerably easier for the operator, is it not, than making them by hand? 30

A. It is easier and much faster.

x-Q. 64. What I particularly had in mind was that it does not fatigue the operator to the same extent, does it?

A. No; it does not.

x-Q. 65. In other words there is less exertion?

A. Yes.

x-Q. 66. What is the normal amount of stretch em- 40

Talcott I. Curtis for Defendant—Redirect.

ployed in originally attaching the ply to the core, in connection with the Thropp machine?

A. We are using about twelve per cent as a standard now.

x-Q. 67. What is the general stretch that is used by Thropp machine users?

10 A. It varies in different factories. Each one has their own idea in regard to stretch. It varies from what I heard Mr. Walch say up to about eighteen or twenty per cent. In fact he is the first one that I heard say they stretch six per cent. That is very little stretch. It runs to about eighteen to twenty per cent; some places use eighteen per cent.

REDIRECT-EXAMINATION BY MR. SEWARD:

20 Rd-Q. 68. Will you describe a little more in detail what this stitcher used in hand stitching is like; describe the tool.

A. It is a steel roller, three inches diameter, about one sixteenth of an inch thick at the edge; it is mounted in a wooden handle.

Rd-Q. 69. How is it you remember the exact day when you left the Empire Company?

30 A. Well, I have that on a watch here, a watch they gave me; I have it in my pocket; the date is on there; I always remember that.

Rd-Q. 70. You mean that that watch was given you by the employees of the Empire Company, May 29th, 1909?

A. Yes; when I left there.

By Mr. Rogers:

Rx-Q. 71. In other words, it was in 1909 that you left the Empire Company; is that correct?

40 A. Yes, sir.

Talcut I. Curtis for Defendant—Redirect.

Rx-Q. 72. Have you any similarly good evidence to indicate that you came to the Empire Company in the spring of 1906?

A. I am not positive of the date of that.

By Mr. Seward:

R-rd-Q. 73. What do you say you are not positive of the date of?

A. I know I was there in 1906, but I do not know just the date; just the date I could not remember. 10

By Mr. Rogers:

R-x-Q. 74. But you have not any documentary or other evidence like the engraved watch, for instance, to prove that you came to the Empire Company in 1906?

A. No.

Deposition closed.

20

Signature waived.

30

40

Will C. State for Plaintiff—Direct.

IN THE
UNITED STATES DISTRICT COURT,
DISTRICT OF NEW JERSEY.

10

FRANK A. SEIBERLING,
Plaintiff,

VS.

THE JOHN E. THROPP'S SONS COMPANY,
Defendant.

In Equity,
No. 614.

Plaintiff's Rebuttal Testimony.

20

Testimony taken on behalf of the plaintiff, pursuant to notice and agreement of counsel, before CHARLES J. CAREY, a notary public, at the Statler Hotel, Cleveland, Ohio, beginning on Wednesday, July 7, 1920, at 11 o'clock A. M.

APPEARANCES:

ROBERT FLETCHER ROGERS and LUTHER E. MORRISON,
Esqs., for plaintiff; and
30 E. CLARKSON SEWARD, Esq., for defendant.

Whereupon WILL C. STATE, a witness called on behalf of the plaintiff, being first duly sworn, in answer to interrogatories propounded to him by Mr. Rogers deposes and says as follows:

Q. 1. Please state your name and residence.

A. Will C. State; Akron, Ohio.

Q. 2. You are of legal age?

40

A. I am.

Will C. State for Plaintiff—Direct.

Q. 3. You are in the employ of The Goodyear Tire & Rubber Company, of Akron, Ohio?

A. I am.

Q. You are the originator of the Goodyear commercial machine for the manufacture of fabric carcasses for tires, are you not?

A. I am.

Q. 5. How long have you been in the employ of the Goodyear Company? 10

A. 19 years the 7th of May.

Q. 6. How long has the Goodyear Company been manufacturing automobile tires, if you know?

A. Since about 1903.

Q. 7. How were these fabric tires made originally,—by machine or by hand?

A. By hand.

Q. 8. Will you kindly briefly describe this hand method of making tire carcasses? 20

A. First ply drawn on a core by hand, stitched down; second ply drawn on—or stretched on, stitched down in the same manner; bead applied; third ply was drawn on by hand, or stretched on by hand, stitched down over the bead; fourth ply in like manner.

Q. 9. You say plies were drawn or stretched on to the core. Was there a considerable degree of stretching involved in this operation, or not? 30

A. The stretch was not considerable. It was medium.

Q. 10. Can you approximate the percentage of circumferential stretch used in that hand method?

A. About 12 per cent.

Q. 11. This step that we have just been discussing is the so-called "circumferential stretching", is it not?

A. Yes, it is.

Q. 12. Now, will you kindly say how the plies were stitched down on to the core? I mean by that the portion 40

Will C. State for Plaintiff—Direct.

of the ply that was not caused to adhere to the core by the circumferential stretching.

A. The operator would take hold of the ply, take it in his hand and start to pulling toward the center of the core; and the stitcher—he would start to stitching it down in a manner like a sawtooth,—just wipe it back and forth with the stitcher till he come down with the bead; all the time he was pulling the ply radially, until he
10 come to the—practically to the base of the tire, and then the tendency was to take the stitcher a little sideways to rub it down over the bead.

Q. 13. You say the operator pulled the skirt of the fabric inward radially, and at the same time worked it down with a tool. What was the effect of this joint operation by the operator?

A. He would get stretch circumferentially with the tread; he would get radial stretch when he pulled it down
20 toward the bead portion.

Q. 14. You have spoken of the "sawtooth" method. Do you mean by that that the tool was operated in a manner substantially similar to that indicated in the sketch marked "Plaintiff's Exhibit No. 7"?

A. Yes.

Q. 15. Then I understand from your description of this hand-stitching method that there was stretch in two directions, namely, the original circumferential stretch
30 and the subsequent radial stretch; is that correct?

A. It is.

Q. 16. Do you know whether or not there was any other known method of making tires about the same time, by a different kind of stretching operation?

A. No, I do not.

Q. 17. How about later on?

A. Why, I know there were tires made. They would stretch so much on the circumference of the tread that it
40 would practically form the tire.

Will C. State for Plaintiff—Direct.

Q. 18. You mean all the way down to the bead?

A. All the way down. Very little left to do.

Q. 19. In other words, then, there were two kinds of general methods of making tires; one wherein circumferential and radial stretching were both employed to shape the fabric to the core, as in the Goodyear practice; and another wherein circumferential stretch was almost entirely depended on for the purpose of shaping the fabric 10 to the core? Is that correct?

A. It is correct. These were the only two general methods I knew of.

Q. 20. Can you tell me why the Goodyear Company made its tires with what I may term the "double-stretch" method, instead of by the "single circumferential-stretch" method?

A. We think that it made a better, uniform, balanced tire.

Q. 21. And that was regarded as superior to the single-²⁰ stretch (circumferential) method?

A. Yes.

Q. 22. Now, what do you know about any early effort made by the Goodyear Company to embody this double-stretch method into a machine operation?

A. The Seiberling-Stevens machine.

Q. 23. Did you see that machine?

A. I did.

Q. 24. Do you remember about when that machine was³⁰ built by the Goodyear Company?

A. Why, it was sometime—started sometime in 1903.

Q. 25. What was the general principle on which that machine operated?

A. They had a method to draw the fabric on to the core. The next operation was to change the speed a little, and had reciprocating fingers which shoved the fabric down toward the bead.

Q. 26. In other words, it used the double-stretch⁴⁰

Will C. State for Plaintiff—Direct.

method; that is to say, it attempted to draw the fabric on to the core originally by circumferential stretch, and then the fingers were used to form the unattached skirts to the core; is that correct?

A. Correct.

Q. 27. Were these jigger fingers reciprocated or moved
10 up and down on the side of the core?

A. They were reciprocated up the side of the core.

Q. 28. Up and down?

A. Up and down the side of the core.

Q. 29. Was the operation of these jigger fingers anything like the hand operation which you have described as the "sawtooth" method?

A. Yes, the jigger fingers practically took the place
20 of the little paddle they had used to push down the fabric. They didn't have the movement that the hand tool had. I mean they did not operate at the same angle as in the sawtooth method.

Q. 30. Did these jigger fingers successfully form the fabric to the side of the core?

A. They did not.

Q. 31. Do you know whether or not any commercial tires were produced on that Seiberling and Stevens machine?

A. There was a very few.

Q. 32. And what became of that machine ultimately?
30

A. It was scrapped, junked.

Q. 33. In other words, as I understand your testimony, this Seiberling and Stevens machine attempted to embody the previous Goodyear practice of dividing the stretch into two distinct operations, namely, original, circumferential stretch over the tread of the tire, and, subsequently, radial stretch to form the unattached skirts to the side of the tire down to the bead; is that correct?

40 A. Yes.

Will C. State for Plaintiff—Direct.

Q. 34. You say you saw the Seiberling and Stevens machine in operation?

A. Yes, I did.

Q. 35. Can you tell me what was the highest speed of the core in that machine?

A. I would say it was about—that is, the high speed was about 30 r.p.m.

Q. 36. Now, after that Seiberling and Stevens machine 10 was junked, what method was employed by the Goodyear Company in making its tires?

A. The same hand methods, original hand methods.

Q. 37. You mean the one previously described by you?

A. Yes.

Q. 38. And that lasted for how long a time?

A. I would say about 3 1/2 years.

Q. 39. What was the financial condition of the Goodyear Company during the period last mentioned, namely, 20 after the scrapping of the Seiberling and Stevens machine?

A. Very bad.

Q. 40. And what was the next attempt, if any, to make a tire by machinery at the Goodyear plant?

A. I started some experiments early in 1907.

Q. 41. And did those experiments ever result in a commercial machine?

A. They did.

Q. 42. And when was that commercial machine first³⁰ used for making tire carcasses?

A. The latter part of 1907.

Q. 43. Was it put on the floor in regular practice at that time or later on?

A. No, it was put on the floor early in the spring of the following year,—1908.

Q. 44. And what method of making a tire carcass was embodied in that machine? I refer to the stretch system.

A. Started out with a system to make a tire with 40

Will C. State for Plaintiff—Direct.

Q. 61. I observe these sketches are numbered. Am I to understand that the numbers give the substantial succession in point of time of your several experiments?

A. The successive steps in the experiment.

Q. 62. In other words, I understand that, if these sketches are not numbered in exact chronological order, you will state the fact when you come to describe them?

A. I will.

10 Q. 63. Referring, first, to the sketch marked "1st device", will you kindly tell me what it is?

A. I had mounted a core on a finishing-stand and chuck attached to worm and gear to draw the worm—to—engaged to draw on the ply; then disengage the worm, put the crank on the direct shaft, to revolve the core by hand.

20 Q. 64. If I understand you, then, correctly, you were able to drive the core in two ways; either through the worm, in order to get a slow speed for the core to effect the original circumferential stretch, after which you disengaged the worm and put the handle directly on the shaft of the core to rotate it more rapidly; is that correct?

A. Yes.

Q. 65. And how, in connection with this arrangement, did you stitch down the skirts of the ply?

A. I disengaged the worm, put the crank on the end of the direct shaft, had a man rotate—speed it up, and had another man to take a hand-stitcher to roll it down.

30 Q. 66. How high a speed, if you can estimate it, were you able to get by turning the core at the higher speed you have mentioned?

A. About 75 or 80 r.p.m.

Q. 67. And was the operation of rolling down the skirts of the ply on the core, when rotated at this speed, successful?

A. No, it was not.

40 Q. 68. Can you state some of the reasons for its not being successful?

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A. In using the hand tool, the handspinning tool, it was hard to guide it. It would jump in and wrinkle the fabric. It didn't seem possible for it to hold it steady enough. You couldn't gauge the advance of the stitcher, you couldn't control it; it jumped. It wouldn't stitch it down even. It would lead in just like a thread. You would miss a lot of the fabric and not roll it down. His hand off, and come in contact with the fabric; holding it with two hands, and would throw a lot of wrinkles in it, in the edge of it.

Q. 69. Was there any difficulty when it struck the splice?

A. When it struck the splice, it jumped.

Q. 70. Did you get any appreciable degree of radial stretch?

A. Very little.

Q. 71. Did you get a sufficiently high speed of rotation to throw the skirts out sufficiently by centrifugal force?

A. No, did not.

Q. 72. When you originally stretched the fabric on to the core by circumferential stretch, how was the pull of the core resisted; or, in other words, what was the source of fabric supply?

A. The fabric was cut to length; and a man held on to it, just gripped it, held back, while we drew it on.

Q. 73. I next hand you the sketch marked "2d device"; and ask you to explain the difference, if any, over the "1st device."

A. I had another stand with a roll of fabric on it, installed a brake on the end of the shaft that held the fabric, had weights to adjust the tension, and drew it on under tension to get the circumferential stretch on the tread of the core.

Q. 74. In other words, the difference between the two sketches is, that the "2d device" merely adds a fabric-

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tension device for the purpose of securing the circumferential stretch; is that correct?

A. Yes.

Q. 75. And, so far as the working down of the skirts of the fabric is concerned, there was no change?

A. No change.

Q. 76. Did this tension device enable you to get better
10 results in the direction of uniform tension?

A. It did.

Q. 77. I next hand you your sketch marked "3d device"; and ask you to point out the difference, if any, over what is shown in "2d device".

A. The "3d device" is the same as "2d device", with the exception of I put a "U" or horseshoe plate around the core, so the man could have something to rest his hand on when he tried to spin-roll it down with the
20 hand spinner.

Q. 78. This horseshoe device that you mention appears to embrace the core rather closely. Are its proportions correctly shown in the sketch?

A. No, they are not. It was rather a large shoe or "U", and was large enough to allow the skirts to run between. It was only used, as I said before, for the man to have something to rest his hand on when he run the hand tool down the side.

Q. 79. Well, now, did this horseshoe arrangement
30 solve the difficulties you had previously encountered in the handspinning operation?

A. It did not.

Q. 80. I suppose it did improve them to a certain extent?

A. It helped the man a little in holding the tool.

Q. 81. Were you able to get the requisite amount of radial stretch you were after by the use of this horseshoe, when the man rested his hand on it?

40 A. Did not.

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Q. 82. I also observe in this sketch an implement marked "AA". Will you kindly tell me what that was?

A. It's a handspinning roll or tool. It has a spring to allow a certain amount of give when going over a splice.

Q. 83. What was your object in inserting this spring in the hand tool?

A. With the solid tool, it would jump—when it come 10 to a splice, it would jump; and sometimes would jump out of his hand; he couldn't hold it against the plies on the side and advance it properly.

Q. 84. I next direct your attention to sketch entitled "4th device"; and will ask you to state what, if any, change is embodied therein over "3d device".

A. The change over the "3d device" is having it belted from a shaft, having the high speed belted from a shaft.

Q. 85. You mean that for the fast speed, the higher speed, of the core you used a belt and pulleys to shafting? 20

A. Yes, belt and pulleys to shafting.

Q. 86. How about the low speed to draw the fabric on to the core in this "4th device"?

A. Used the device same as in previous sketches,—the worm and the gear.

Q. 87. Now, what was your idea in attempting to drive the shaft and the core at high speed from belting, instead of by the crank as in the previous sketch?

A. Wanted to get a higher speed than a man could do 30 it by crank.

Q. 88. Well, why did you want to get a higher speed?

A. I wanted to get the skirt of the ply to come out from the core, and to help get the wrinkles out of the skirt.

Q. 89. You mean because of the greater centrifugal force involved?

A. Yes.

Q. 90. And you mean with the hand-turned core you 40

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could not get a sufficiently high speed to give you the centrifugal force?

A. Could not.

Q. 91. And therefore you turned to a power drive; is that correct?

A. Yes.

Q. 92. I next hand you sketch marked "5th device"; and ask you to point out what, if any, difference there
10 is therein over what is shown in "4th device".

A. The change made was to discard the drive from the shaft and put on a belted drive from a motor.

Q. 93. And why did you change from the drive from the shaft to the motor?

A. It was easier to change the speeds with the motor than it was from a line-shaft.

Q. 94. Was it a variable-speed motor?

A. It was variable in fact, in this way: I used a simple rheostat to step it up on the speeds.
20

Q. 95. In other words, by the use of this motor you could change its speed so as to get the desired speed of rotation for the core?

A. Yes.

Q. 96. Referring again to this sketch, what parts were used to stretch on the fabric originally; I mean by that to get the circumferential stretch?

A. The same tension was used that drew it on with the worm gear.

80 Q. 97. In other words, then, the motor was not used for the slow speed?

A. No.

Q. 98. But merely to give a high speed of rotation to the core, which high speed you could regulate by the attached rheostat; is that correct?

A. Yes.

Q. 99. I next hand you sketch "6th device"; and ask you to state what, if any, change was made over "5th
40 device".

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A. I have changed from a single roll of fabric to two rolls of fabric; and the reason was, to get the first ply—or, in putting on the first ply, in crossing the second ply it would have been necessary in the “1st device” to reverse the roll, take it off and reverse it. In this one I used plies of all the same width for the four plies. Simply took off the one roll for one ply, and the second roll for the second; and reversed—come back to the first roll, put on the third ply with the first roll, went back to the second roll and put on the fourth ply; simply to cross it and not have to pull off the roll and get another roll and change it.

Q. 100. In other words, the change in this “6th device” related merely to the provision of a second fabric roll?

A. That’s all.

Q. 101. And there was no change in other respects; is that correct?

A. Correct.

Q. 102. Referring generally to the last four sketches²⁰ under discussion, there had been no change in the means for rolling down the skirts of the fabric on the core?

A. No.

Q. 103. And what you were working on through those four sketches was to get a proper tension device for the original circumferential stretch, and means for giving you the requisite high speed for the core; is that correct?

A. Yes.

Q. 104. I next direct your attention to “Sketch 7”,³⁰ and ask you to state what change appears therein over the four sketches mentioned in the last question.

A. I had taken off the “U” support for the hand-stitcher, put in an adjustable bar or rest, and mounted the spinning-rolls on a pair of tongs.

Q. 105. When you refer to the bar or rest, you mean the bar shown in plan-view and supported by the stand “R” shown in the perspective view, do you not?

A. Yes.

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Q. 106. Now, the tongs you referred to are the elements marked "S", are they not?

A. Yes.

Q. 107. Now, please explain how you manipulated the tongs "S" in relation to the bar or rest you have mentioned.

A. After stretching on the ply, take the tongs in hand,
10 press the rolls together, move them forward, rolling down the fabric on the sides.

Q. 108. Do you mean that, during this operation, the tongs were resting on the rest or bar?

A. They were.

Q. 109. And I understand that the operator took the ends of the tongs in his two hands and pressed them together, so as to cause the rolls to form the fabric against the sides of the core?

A. Yes.

20 Q. 110. And did he advance the tongs during this operation?

A. He did.

Q. 111. So as to bring the stitcher-rolls down to the bead portion? Is that correct?

A. Yes.

Q. 112. And how did that particular arrangement of "Sketch 7" work out?

A. Not very well. The tongs would tip up and cut
30 into the fabric, and wrinkled it, and were very hard to hold.

Q. 113. In that "Sketch 7" the means you used for stretching the fabric circumferentially on the core were the worm and gear, just as in the previous sketches?

A. Yes.

Q. 114. And the high speed of the core was obtained from the motor, just as in the previous sketch?

A. Yes.

40 Q. 115. I next direct your attention to "Sketch 7a";

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and ask you to state what changes, if any, appear over the devices illustrated in "Sketch 7".

A. I added two more rolls of fabric, making four, and a wood roll bearing on the roll of fabric, which was being used to take up the liner. I took off the worm gear, and direct geared through a clutch for the two speeds, the high and the low. I changed the drive a little; belted from a motor to a jack-shaft on the floor with a clutch 10 on it, and from that to the pulley on the clutch-shaft.

Q. 116. In other words, there were two principal changes in this sketch. The first of them related to the fabric-supply rolls, wherein you used four rolls which were adjustable, so as to bring any desired one into operative relation to the core; and the second embodied a two-speed device for the core; is that correct?

A. Yes.

Q. 117. What was the object of the two-speed device?

A. The low speed to stretch on the fabric on the circumference of the core; the other was to get a high rotation on the core to roll it down on the side. 20

Q. 118. There are no rolling devices shown in this sketch, however?

A. No.

Q. 119. Now, with reference to the plan-view of the two-speed device, you think the proportions therein are correct?

A. No.

30

Q. 120 In other words, the detailed view of the speed-change mechanism is merely a rough sketch, without any attempt to get exact proportions; is that correct?

A. Yes.

Q. 121. In this "Sketch 7a" the worm for getting the circumferential stretch disappears?

A. Yes.

Q. 122. And for the first time you rely on a speed-change mechanism for getting low and high speeds; the 40

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former being used to obtain the original circumferential stretch, and the latter to give the core a high speed for forming down the skirts of the fabric: is that right?

A. Yes.

Q. 123. Now, I want to ask you if you had ever, before your experiments, seen or known of a high-speed core?

A. No, I had not.

10 Q. 124. I next call your attention to "Sketch 7^b," and ask you to state what changes appear therein over the forms shown in "Sketch 7^a."

A. There are no side-forming devices shown in "7^a;" and my further experiments as to these side-forming devices are illustrated in "Sketch 7^b." There was a support for a moving top table or slide to advance the tongs on which the rolls were mounted to press the side walls of the fabric down on to the core.

20 Q. 125. When you referred to the "slide," you mean the part marked "M," do you not?

A. Yes.

Q. 126. And on this slide was mounted tongs similar to those shown in "Sketch 7"?

A. Yes.

Q. 127. Which tongs were manipulated by the hands of the operator so as to press the spinning-rolls "R" inward against the core and form the fabric to the sides of the core?

30 A. Yes.

Q. 128. Now, will you kindly describe the means employed for advancing the slide "M" toward the core during the operation you have mentioned?

A. A lever "W" pivoted on the stationary stand with a slot in it pivoted to the slide "M," which would allow you of moving the table on which the tongs and rolls were supported forward or backward.

Q. 129. And how did this system of advancing the
40 slide "M" work out in practice?

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A. The tendency was to lead in quickly, and at times was hard to hold.

Q. 130. Why was it hard to hold?

A. From the tendency to lead—or for the rolls to draw it in.

Q. 131. You mean that the contact of the rolls with the fabric on the core tended to pull the slide in?

A. Yes.

10

Q. 132. What was the reason for this tendency?

A. In starting it on, it seemed to take a screw movement in the rolls, not advancing evenly on the side of the fabric; and, after they had started that way, they would continue.

Q. 133. You mean that it was difficult for the operator to advance the slide toward the core regularly?

A. Yes.

Q. 134. Because the contact of the rolls with the side of the core tended to pull the slide in?

20

A. It did.

Q. 135. And, therefore, it was not easy to get a uniform advance of the rolls; is that correct?

A. Yes.

Q. 136. I next hand you "Sketch 8," and ask you to point out the difference therein over "Sketch 7^b."

A. Instead of operating the slide with a lever, it was operated with a screw and hand-wheel. In the hand-wheel you were able to change the position of the handle into different holes, so the operator could be able to change the speed of advancement.

Q. 137. Now, did this device, particularly referring to the screw-feed of the slide, overcome the difficulty you have testified to in connection with "Sketch 7^b," as to which you stated that there was a tendency, because of the engagement of the rolls with the core, to draw the slide in by itself?

A. It did.

40

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Q. 138. Just how and why was that tendency overcome in connection with the screw-feed?

A. The screw would not allow it to do it, held it back.

Q. 139. In other words, then, the screw had two functions: it enabled the operator to advance and retract the slide at will, and, moreover, resisted the tendency of the rolls to pull the slide in; is that correct?

10

A. Yes.

Q. 140. I also call your attention to the fact that the tongs as shown in the detail view are provided with a spring "S." Will you kindly state the function of that spring?

A. To bring the rolls together in rolling the fabric down on the sides of the core.

20

Q. 141. In other words, because of the spring "S" the spinning-rolls were forced together by a yielding or spring action; is that correct?

A. Yes.

Q. 142. Now, referring to the wheel "H" and handle "X" of the wheel, will you state how and why the insertion of the handle in one or other of the holes affected the speed of the slide advance?

30

A. In the hole nearest to the center it slowed it up—or the hole nearest to the center it speeded it up, and the outside hole, extreme edge, it slowed it up. Now, the slow hole is the outside hole, and the fast one was the inside.

Q. 143. So that in this way you were enabled to control, more or less, the hand operation of the operator so far as relates to the speed and regularity of advance?

A. Yes.

Q. 144. Now, referring again to the lever "W" of "Sketch 7^b," did the screw you used in "Sketch 8" tend to regulate the advance of the slide and make it more uniform?

40

A. It did.

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Q. 145. I next refer you to "Sketch 9," and ask you to point out the differences therein over "Sketch 8."

A. That separated the arms that held the spinning-rolls, pivoted them separately and added a flat spring to hold the spinning-roll against the side of the core in spinning down.

Q. 146. In other words, instead of using the previous tongs, you used two separate arms independently pivoted on the slide, and in connection with each of the arms you used a flat spring to force the rolls inwardly against the side of the core; is that correct? 10

A. Yes.

Q. 147. Were there any handles or means of other kind connected to these arms, whereby the operator could control the pressure of the rolls against the side of the core?

A. There were two handles at right angles that a man could take in his hand and either hold it away from the core or press it against the core. 20

Q. 148. In other words, these control-handles were an auxiliary whereby the operator could either augment or diminish the spring pressure of the rolls against the side of the core; is that correct?

A. Yes.

Q. 149. In what circumstances would it be desirable for the operator to have this additional control? 30

A. After it got around the wide part of the core down toward the arms, and to draw them together, give a little more pressure at this point.

Q. 150. And did the character of the fabric you were operating on ever render it desirable for the operator to have this additional control?

A. There was times—the development was worked in an attic, and there was times when the fabric would be dried out a little and was very stiff and very hard to 40

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handle; and oftentimes they would have to use pressure with his hand in helping the springs out, to make it stick.

Q. 151. I next hand you "Sketch 10," and ask you to point out the differences therein.

10 A. The table "X" that the spinning-rolls were mounted on had adjustment screws to raise and lower the table. I found this necessary in the experiment to find the position in which the rolls worked best. If they were below the center, there was a great tendency to very badly wrinkle; and the final adjustment as to height was a fraction above the center.

Q. 152. You mean to say it made a difference how the rolls were adjusted vertically in relation to the core?

A. It did.

Q. 153. And did you have any great difficulty in reaching the right point of application?

A. There was a lot of experiment on it.

20 Q. 154. In other words, you tried the rolls at different heights in relation to the core before you determined the final position?

A. I did.

Q. 155. And that final position, I understand you to state, to be just a trifle above the horizontal radius of the core?

A. Yes.

30 Q. 156. And for the purposes of these adjustments you supplied the table "X" with adjusting screws, so that you could raise or lower the arms and spinning-rolls with the table, to get the best operative position; is that correct?

A. I did, yes.

Q. 157. I call your attention to another feature in this "Sketch 10," namely, the spring "S," best shown in the detailed view. Will you kindly point out the difference between that arrangement and the one shown in
40 "Sketch 9"?

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A. It was changed from a flat spring to a coiled spring; forwarded the center toward the rolls, to bring the rolls together against the side of the core.

Q. 158. In other words, instead of employing two flat springs, one for each arm, you employed a single interior spring connecting the two arms; is that correct?

A. Yes.

Q. 159. I next hand you "Sketch 11," and ask you to point out the differences shown therein. 10

A. The arms were mounted forward on the sliding table were shorter, and had a flat spring against the side.

Q. 160. In other words, you reverted to the use of the two flat springs?

A. I did.

Q. 161. And also shortened up the arms and made them of different shape?

A. I did. 20

Q. 162. And, with reference to the pivotal position of the two arms in "Sketch 11," are they shown as pivoted at the same point of the slide "M," or at a different point?

A. They were forward, to better go round the core; practically out on the edge.

Q. 163. And were the pivots the same distance from each other?

A. A little wider apart. 30

Q. 164. Did you find this arrangement better than the one given in "Sketch 10"?

A. It was.

Q. 165. Can you state why?

A. Had a better clearance around the core.

Q. 166. I next hand you "Sketch 12," and ask you to comment on the changes therein.

A. We changed from a flat spring to a coiled compression spring for the arms. 40

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Q. 167. In other words, you mean that you used a spiral compression spring for each of the arms, at the outside thereof, instead of the flat spring shown in the previous sketch; is that correct?

A. That is correct.

Q. 168. And in what respect, if any, was this employment of the spiral spring superior to that of the flat spring?

A. The flat springs didn't give as much go and come around the core; they were continually breaking and getting set.

Q. 169. In other words, the spiral springs had a greater extent and degree of elasticity than the flat springs?

A. Yes.

Q. 170. I next direct your attention to "Sketch 13," and ask you to state what it discloses in the development of the machine.

A. It shows the table head with the different tools mounted on it,—the rolling-down or spinning rolls; the tread-roll for smoothing out of wrinkles on the tread, and air-traps; the bead-setting device; and the trimming tools.

Q. 171. Was the table mounted so that these four tools that you have referred to could be brought into operation successively?

A. Mounted the same as a turret-head; could be revolved and set at any position the tool was needed.

Q. 172. In other words, the table was rotatable around an axis?

A. Yes.

Q. 173. So that you could bring any one of these four tools into operative position as required?

A. Yes.

Q. 174. I next direct your attention to "Sketch 14," and ask you to state what it represents.

A. It's the different screws that were experimented

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with to advance the table on which the tools were mounted on.

Q. 175. I observe that there are four screws shown in "Sketch 14," numbered, respectively, "1," "2," "3," "4." Will you kindly state in sequence what they are?

A. No. 1 is a square-threaded screw $3/16$ pitch; No. 2 is a square-threaded screw $1/8$ pitch; No. 3 is a "V"-threaded screw $1/16$ pitch; No. 4 is a "V"-threaded screw $10 \frac{1}{8}$ pitch.

Q. 176. Did you experiment with these screws in the order indicated?

A. Yes.

Q. 177. In other words, you started with a square-threaded screw $3/16$ pitch; next you employed a square-threaded screw $1/8$ pitch; next you experimented with a "V" screw $1/16$ pitch; and finally wound up with a "V" screw of $10 \frac{1}{8}$ pitch; is that correct?

A. Yes.

20

Q. 178. Why was it necessary for you to go through those various steps and employ so many different kinds of screws in your experiments?

A. In attempting to get an even rolling of the spinning-rolls. With the heavy pitch, it advanced too fast, and wouldn't cover the surface completely and evenly.

Q. 179. In other words, the advance of the slide, and of the rolls thereon, was governed by the pitch of the screw; and you did not get the desired result until you had made four different attempts with different kinds of screws; is that correct?

A. Yes.

Q. 180. I next hand you "Sketch 15," and ask you to state what it represents.

A. Two types of hand stitcher-wheel; one with a very sharp edge, and one with a blunt edge. The change was made in those two because the sharp edge would cut into the fabric, groove it; and the second one was made to

40

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correct this fault. The third is a machine stitcher-wheel, which has rather a sharp edge; which was changed to one with practically a light ball on the end,—a beaded edge. The fifth one is a machine stitcher-wheel rather blunt.

10 Q. 181. In other words, you did not find the ordinary configuration of the hand stitcher-wheels suitable to your purpose, and you therefore tried several types of stitcher-wheels before you arrived at the desired result; is that correct?

A. Yes.

Recess.

After recess; appearances as before:

20 The witness WILL C. STATE again took the witness-stand for further examination by Mr. Rogers; and he testified as follows:

Q. 182. Judging from "Sketch 15," you made the wheel larger and blunter?

A. I did.

Q. 183. Now, about the bearings of the hand stitcher-wheels; were they plain bearings, or what were they?

A. Plain bearings.

30 Q. 184. Did you find plain bearings suitable for your purpose?

A. I did not. They would get cut out, stick; and sometimes they would simply throw off.

Q. 185. Why did you not lubricate them?

A. Oil would get on to the fabric and spoil the connection.

Q. 186. Now, what did you use ultimately?

A. The ball bearings.

40 Q. 187. Now, about the angle at which you mounted

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the roll in your machine in reference to the plane of the core; what was the nature of that angle?

A. Against the core it was an acute angle; and, as you got to the bead to go over—that is, it was acute enough angle to give pressure to the side of the core, and obtuse enough to go over the bead.

Q. 188. Why did you have the angle acute at all?

A. First it was necessary to compress the fabric—
or, rather, press the fabric against the side of the core
on the inside, and allow it to have a certain frictional
contact with the skirt of the fabric on the outside to get
radial stretch. 10

Q. 189. Was there any other reason for making the angle acute?

A. In the high speed the core rotated, and in throwing the skirt of the fabric out, you would have to make it acute enough to miss the outside edge. 20

Q. 190. In other words, to keep it from tangling up—

A. With the outside of the skirt.

Q. 191. With the thrown-out skirt?

A. Yes.

Q. 192. Now, generally with regard to the results of your handspinning experiments, what was the principal fault in them?

A. In the handspinning, when they had the high-speed core, got in a great deal of trouble with the skirt entang-
ling itself with your hand, with the handspinning roll;
and was not able to advance it in a regular way; was
spasmodic, and didn't do a good job. 30

Q. 193. Did you get radial stretch enough for the hand-held tool?

A. Very little.

Q. 194. And, comparing the handspinning experiments you have testified to, namely, first, with the hand-operated core, and, second, with the high-speed, power- 40

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operated core, were the results improved with the power-operated core, or what?

A. The troubles were intensified with the high-speed core over the hand-operated core.

Q. 195. Why, if you can tell?

10 A. For the reason that he couldn't run down evenly; jump; entangle with the skirt and wrinkle it; and was not satisfactory; you couldn't get the amount of stretch that was necessary in the side wall of the tire,—amount of radial stretch.

Q. 196. What was the function of the tread-roll in your machine?

A. It was simply to smooth out the extreme tread of the tire, and take out the wrinkles, air-traps.

Q. 197. In the operation of the machine, with what percentage of stretch did you put the ply on the core?

20 A. About 12 per cent. on the tread of the core.

Q. 198. Can you state, or have you any idea, what amount of radial stretch you got in the operation of your spinning-rolls?

A. You would get about 15 per cent. at the bead.

Q. 199. You say 15 per cent. at the bead. Do you mean by that that the maximum amount of stretch was at the bead?

A. Was at the bead, yes.

30 Q. 200. And that the stretch would be less than that, calculating back to the line of attachment?

A. There was very little at what would be about the middle, or median line, of the core.

Q. 201. And it increased from that up to 15 per cent. in the bead portion?

A. It would.

Q. 202. In your machine did the spinning-rolls always press the fabric against the sides of the core?

A. It did.

40 Q. 203. Did you ever know or hear of a mode of

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operation in connection with your machine wherein the rolls were held outwardly, away from the core, so as not to press the fabric against the core, by reason of the centrifugal effect of the outflung skirts?

A. I never did.

Q. 204. Did the first commercial machine operate successfully?

A. It did.

Q. 205. Was it afterwards improved or modified?

10

A. Yes.

Q. 206. In what way particularly?

A. Well, one thing, the high speed was reduced.

Q. 207. Do you know what the high speed of your original machine was?

A. No, I don't remember what it was.

Q. 208. You say you subsequently diminished the amount of the high speed. What was the objection to the very high speed?

20

A. Extreme speed, you would have to get ahold of the core and pull it over to start it up, and it took a long time to get it up to speed; and the same story was true of trying to slow it down. If you put the brake on, it threw the core off the chuck.

Q. 209. You mean that, with the very high speed, it was necessary to impart additional momentum to the core, in order to get the speed called for in the machine?

A. Yes.

30

Q. 210. Now, you have referred to a brake for slowing down the speed at the end of the operation. Where was that brake applied?

A. Just inside of the bearing on the chuck side, on the shaft that the chuck is on. Here would be the tire, there the bearing, and then that (indicating).

Q. 211. Did that difficulty in securing and cutting down the original speed cause undue or unnecessary strain on the gearing?

40

Will C. State for Plaintiff—Direct.

A. Yes, was a heavy strain on the gearing.

Q. 212. How did it happen that you first gave the machine so high a speed?

10 A. Probably—this attic we worked to experiment in was very hot all the time, and the fabric would dry out and get very stiff; and, naturally, we weren't wasting any material in using this material; and in experimenting on the tires it would be so stiff it made us go to high speeds to secure the necessary flare-out of the skirt of the tire.

Q. 213. Was it necessary to use this high speed in connection with softer and more pliable fabrics?

A. It was not.

Q. 214. Was that the reason you subsequently cut down the speed?

A. It was.

20 Q. 215. You said that you were working in an attic. What do you mean by that?

A. Well, it's a two-story building with gable roof. We called it the attic of this building. It was very low; and we worked there all in the summer time.

Q. 216. You were working in the summer? The summer of what year?

A. 1907.

Q. 217. Now, relating to the springs that pressed the stitcher-arms inward, was it possible to make a tire by
30 the use of these springs without hand control?

A. Yes.

Q. 218. Did you ever see this done?

A. I did.

Q. 219. Then what was the value of the additional hand control which you applied to these arms?

A. Along the tongue of the core, where it was thin, they could help out the pressing on by spreading them with your hand.

40 Q. 220. In other words, the hand control was an

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auxiliary refinement, although not a necessary one in all cases; is that correct?

A. Yes.

Q. 221. Do you know when it was, about, that you finished the experimental work you have been describing to-day?

A. The latter part of 1907.

Q. 222. And, after you finished the experimental 10
work, what was the next step?

A. Machine was put on the floor, and production.

Q. 223. I mean, after the experimental work and before the first commercial machine was constructed, what did you do after you finished the experimental work? In other words, who designed and worked up the machine for you?

A. The draftsman in my office.

Q. 224. Did you supervise the drawings of the de- 20
velopment of that work?

A. In a general way.

Q. 225. You say, "In a general way." What do you mean by that?

A. Well, I didn't have—I didn't get right down to the details in all the apparatus; simply had a general scheme of it.

Q. 226. Did you pay close attention to all of the details of that design?

30

A. I did not.

Q. 227. Did you pay sufficient attention to determine whether or not your ideas were being carried into the machine?

A. Yes.

Q. 228. But you did not pay close attention to all the details of construction?

A. I did not.

Q. 229. Now, are you able to say whether or not that 40

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first commercial machine was built entirely from drawings?

A. There was some parts of it from drawings, some from just pencil sketches, some of it was built from templates.

Q. 230. In other words, you don't think there was ever in existence a complete set of drawings for that first commercial machine?

A. There was not, that I know of.

Q. 231. Do you know whether or not at any time the Goodyear Company destroyed any of its drawings or records?

A. Along in 1913 there was a general housecleaning of the Drafting Rooms. The drawings were renumbered, especially the building drawings. A great many drawings and sketches were destroyed.

Q. 232. Do you know whether or not any of the drawings of that first machine are still in existence?

A. A few.

Q. 233. Now, these sketches that were produced by you this morning to illustrate the progress of your experimental work—whose idea was that?

A. Mine.

Q. 234. Can you tell how it was that you volunteered to make those sketches?

A. In a discussion with Mr. Rogers on the machine —the first experiments on the machine.

Q. 235. At which time did Mr. Rogers ask you what you had done in this experimental work?

A. Yes.

Q. 236. And what was your response generally?

A. Said I could sketch it out better than I could tell you.

Q. 237. Do you claim to be conversant with all of the features of advantage in the mode of operation of this first commercial machine?

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A. No.

Q. 238. Referring to the machine in evidence, Plaintiff's Exhibit No. 2, when did you last see that machine?

A. In Cincinnati; during the suit at Cincinnati, three or four years ago.

Q. 239. Would you be able to testify from recollection alone as to the construction of that Plaintiff's Exhibit No. 2?

10

A. No.

Q. 240. Now, as to these few drawings which, you say, are still in existence, when was the last time you saw those drawings?

A. Yesterday.

Q. 241. Who showed them to you?

A. Mr. Rogers.

Q. 242. And when was the last previous time before Mr. Rogers showed them to you yesterday that you had seen them?

20

A. Possibly eight years.

Q. 243. And have you studied those drawings so as to be familiar with them, or know exactly what they show?

A. I have not.

Mr. Rogers: Plaintiff's counsel introduces in evidence the sketches referred to by the witness on his direct-examination, entitled "Plaintiff's Exhibit No. 8, Sketches of Experimental Work."

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Direct-examination closed.

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 244. In describing the method of making tires by hand at the Goodyear factory, you used the words "take the stitcher a little sideways to work it down over the bead;" or that's the way I took my note. What did you mean by those words?

40

Will C. State for Plaintiff—Cross.

A. In coming to the bead, holding it at right angles see (indicating)? And vertical. Do you get me?

x-Q. 245. Yes.

A. Coming around the bead, the tendency was to flip the piece over. We would turn it just a little sideways, then go on and roll it.

10 x-Q. 246. By "it" in your last answer you mean the stitcher.

A. The stitcher.

x-Q. 247. The Seiberling and Stevens machine laid the plies of fabric on the core substantially uniformly, did it not? I refer to the circumferential stretch.

A. Fairly uniform.

x-Q. 248. It was sufficiently uniform to accomplish the purpose designed to be accomplished by the stretch, was it not?

20 A. Well, here. You mean was the stretch enough to lay it uniform, or what? Do you mean——

x-Q. 249. I mean the uniformity was sufficient to satisfy the requirements of uniformity in the production of the tire?

A. No.

x-Q. 250. Were you thoroughly familiar with the operation of that Seiberling and Stevens machine?

A. Yes.

30 x-Q. 251. Do you think you were as familiar with it as Mr. Seiberling was,—Mr. F. A. Seiberling?

A. No, I don't.

x-Q. 252. Would you say that the laying of the fabric on to the core by that machine, as far down as the equator of the tire, was substantially perfect?

A. No.

x-Q. 253. You remember the suit of Seiberling versus Firestone, don't you?

40 A. No; I remember some of it, not all of it.

Will C. State for Plaintiff—Cross.

x-Q. 254. You were present in Cleveland during the trial?

A. Part of the trial.

x-Q. 255. Were you there when Mr. Seiberling was testifying?

A. No, I think not.

x-Q. 256. How do you know that the stretch in the plies (I refer to the circumferential stretch) was not sufficiently uniform to accomplish the purpose which the stretch was intended to accomplish in that machine? 10

A. I saw plies measured, giving the amount that we allowed. Sometimes it was under, and sometimes it went over; wasn't uniform.

x-Q. 257. What was the intended amount of stretch?

A. About 12 per cent.

x-Q. 258. How much did it vary?

A. O, I couldn't tell you in per cent. It would sometimes stay open. The ply would be open. And sometimes it would lap over. I say "open"—stay open sometimes a couple of inches; next time it would lap over. 20

x-Q. 259. By "open" you mean the ends of the piece wouldn't meet sometimes?

A. No. I mean this: the ply wouldn't lengthen the amount that was allowed for it to go on. They have a red chalk they measure that ply; and it would go over or under at times, it wasn't uniform.

x-Q. 260. Is this statement with regard to that machine true: "The machine laid the fabric upon the core; it was pressed into position by the drive roller, with its flared sides, and that work, which carried it down practically to the equator of the tire, was substantially perfect"? 30

A. I can't say as to that.

x-Q. 261. You don't know whether that is an accurate statement of the operation of the machine, or not?

A. No, I don't know; I couldn't say.

Will C. State for Plaintiff—Cross.

x-Q. 262. How do you know that the high speed of rotation of the core in that machine was about 30 r.p.m.?

A. Simply my judgment of that looking at it go, that's all.

x-Q. 263. Who had charge of the operation of that machine?

A. A man named Stevens.

10 x-Q. 264. Was that machine scrapped because of the financial condition of the Goodyear Company?

A. No.

x-Q. 265. It was not?

A. No.

x-Q. 266. Why was it scrapped?

A. Unsuccessful.

20 x-Q. 267. Can you state definitely what time in 1907 you started the experiments which you have explained this morning with reference to the sketches produced?

A. I think it was early in June.

x-Q. 268. Were those experiments all conducted in this attic to which you have referred?

A. They were.

x-Q. 269. What part of the building was that?

A. It was the front—what would be the front end toward our old office.

x-Q. 270. Was it near the Tire-making Room?

A. No.

30 x-Q. 271. Was it the same room in which the experiments with the Seiberling and Stevens machine had been conducted?

A. It was.

x-Q. 272. What is the name of the Mr. McDonald to whom you referred?

A. What was his given name?

x-Q. 273. Yes?

A. I couldn't tell you what his given name.

40 x-Q. 274. Do you know his initials?

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A. Just by "McDonald."

x-Q. 275. Do you know his initials?

A. No, I do not.

x-Q. 276. Do you know where he is now?

A. He is in California, with the Goodyear plant there, the new plant.

x-Q. 277. What part of California?

A. Los Angeles.

10

x-Q. 278. What position did he hold in the Goodyear Company in the year 1907?

A. I think he was an inspector.

x-Q. 279. Inspector of tires?

A. Of tires.

x-Q. 280. In this first sketch, that's marked "1st device," is the shaft on which the core chuck is mounted a solid shaft?

A. Yes.

x-Q. 281. And it is rotatably mounted in a bearing in the top of the stand?

20

A. Yes, sir.

x-Q. 282. The worm gear is keyed to the shaft?

A. Yes, sir.

x-Q. 283. And the worm is mounted in a hinged bracket, so as to swing into and out of mesh with the worm gear?

A. With the worm gear, yes, sir.

x-Q. 284. Was that stand one of your regular stands?

A. No.

30

x-Q. 285. Was it made specially?

A. It was made specially.

x-Q. 286. Did you have a drawing from which that was made?

A. No; a sketch.

x-Q. 287. Who made the sketch?

A. I did.

x-Q. 288. You made the sketch?

A. Yes.

40

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x-Q. 289. And to whom did you give it to have the stand made?

A. I don't know, by gosh! It was somebody making the patterns; I don't know who it was.

x-Q. 290. Did you hand your sketch directly to the pattern-maker?

A. I don't remember.

10 x-Q. 291. Do you remember what machinist worked on that device?

A. Austin Thomas.

x-Q. 292. Did any one help him?

A. No. He was by himself for awhile.

x-Q. 293. You think he made the whole of this "1st device"?

20 A. He made the stand. That here, and the worm. Was taken off just as it was, just as it stands there; was taken off a tire of my machine; the thing that you put in— wire tires on to a buggy.

x-Q. 294. Was the hinged arrangement part of that tire?

A. No, it was not.

x-Q. 295. Who made the sketch for that?

A. I did.

x-Q. 296. Who made that hinged bracket?

A. It was made in the shop. I don't know who made the bracket.

30 x-Q. 297. Well, did Mr. Thomas simply make the stand, as far as you know?

A. He did work on it, but he did it back and forth in the Machine Shop. Somebody may have helped him; I don't know.

x-Q. 298. He was the only man you can remember?

A. He was the only man I can. In regard to the "1st device".

x-Q. 299. That you can remember, except yourself?

40 A. Yes.

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x-Q. 300. Is he with the Goodyear now?

A. No. He is dead.

x-Q. 301. How long has he been dead?

A. A matter of six or seven years; I couldn't tell you.

x-Q. 302. What was his position in 1907?

A. He was just a machinist.

x-Q. 303. Now, for the "2d device" did you use the same stand as for the "1st device"? I refer to the part 10 which carries the worm and gear.

A. The pedestal that carries the worm and gear was used in the rear for the tension.

x-Q. 304. And you made a new stand or pedestal for carrying the worm and gear for the "2d device"?

A. No, did not. Same stand. This stand and that stand is alike.

x-Q. 305. Yes; but they were two——

A. We made another stand for the—this was the original stand. We made another stand from the same casting of the same pattern, to carry the tension.

x-Q. 306. Then, if I understand you, in the "2d device" the stand or pedestal used for carrying the worm and gear was the same identical stand as in the "1st device"?

A. Yes.

x-Q. 307. And you made a duplicate stand for supporting the fabric roll in the "2d device"?

A. Yes.

x-Q. 308. Do you know who made that duplicate stand?

A. I think Thomas did.

x-Q. 309. Who made the sketch for the brake-band in this "2d device"?

A. I did. Made it from a cut. A Raymond brake.

x-Q. 310. Was that brake purchased——

A. Couldn't be purchased. We made that. It couldn't be purchased.

x-Q. 311. Do you know who made it?

A. I think Thomas made it.

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x-Q. 312. In this sketch of the "2d device" where you refer to the stock-roll sleeve, do you mean the tube on which the fabric is wound?

A. Yes.

x-Q. 313. In using the "1st device", I understand you to say that the tension was given to the fabric by a man holding the fabric in his hand?

10 A. A roll that had a bar through it, see? Keyed on—to this stock shell. The man had a stock-shell in his hand like this, and the fabric was rolled around it, and it was keyed to the shaft; and just by gripping; he held back.

x-Q. 314. Then the fabric roll was attached to a shaft, the ends of which shaft were held in the hands of the workman?

A. Yes, working pulling back.

20 x-Q. 315. And he gave the tension by his grip resisting the turning of the shaft?

A. Yes.

x-Q. 316. Was that tension more uniform than the tension given in the previous hand-making of tires at the Goodyear plant?

A. No; it wasn't as good.

x-Q. 317. How many tires did you make on the "1st device"?

30 A. Couldn't answer; for I don't know how many were made. Only a few, though.

x-Q. 318. Would it be less than a dozen?

A. Yes.

x-Q. 319. Were those tires completed?

A. No.

x-Q. 320. Were any of them completed?

A. Any of the first tires made on this?

x-Q. 321. Any of the tires made on the "1st device"?

40 A. The "1st device"? I think one or two were completed.

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x-Q. 322. Were they cured?

A. Sure!

x-Q. 323. What did you do with them after they were cured?

A. I don't know what was done with them.

x-Q. 324. Were they commercial tires?

A. No.

x-Q. 325. How many tires were made on the "2d 10 device"?

A. I couldn't answer.

x-Q. 326. Were there more than a dozen made?

A. I don't know; I am not able to answer that.

x-Q. 327. Why can't you answer it?

A. Because I don't remember.

x-Q. 328. Did you see any made on it?

A. Yes.

x-Q. 329. Can you say about how many you saw made on it? 20

A. No, I couldn't say how many I saw made on it.

x-Q. 330. Did you ever see one made on the "2d device" and completed?

A. I saw the carcass completed. Had no side wall or tread on it.

x-Q. 331. Do you know whether any carcass was completed into a finished tire?

A. No.

x-Q. 332. You don't know? 30

A. I do not know. Simply made—made the carcass. Sometimes they would be torn right down again, using the fabric over to make another.

x-Q. 333. Do you remember whether those tires made on the "2d device" were commercial tires in so far as they were constructed?

A. The carcass was made—some of the carcasses that were made on that machine—

x-Q. 334. That's the "2d device"?

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A. The "2d device," were taken to the shop and the defects taken out of them, and were used.

x-Q. 335. What were the defects that were taken out?

A. Badly wrinkled; wrinkled on the side, and wrinkled over the bead.

10 x-Q. 336. Who made the tires that were made on the "1st device"?

A. The first experiment I did myself.

x-Q. 337. Making the tires?

A. About the tire, yes, sir, myself.

x-Q. 338. Who made most of the tires on the "1st device"?

A. The first trial on the first machine, first tire, I made myself. After that, McDonald come there.

x-Q. 339. This Mr. McDonald you referred to before?

A. Yes.

20 x-Q. 340. Did he also make the tires on the "2d device"?

A. He did.

x-Q. 341. Anybody help him?

A. No.

x-Q. 342. Well, can you say whether or not the tires made on the "2nd device" were commercial?

A. You mean by "commercial"—

x-Q. 343. Were they salable tires?

30 A. No.

x-Q. 344. I don't mean were they actually sold: were they salable?

A. I don't know whether they were sold, or not. Some of them were probably sold after they were patched up.

x-Q. 345. Did it require a good deal of work to patch them up?

A. Good deal of work, great deal of work.

x-Q. 346. Hand work?

40 A. Hand work.

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x-Q. 347. Who made the sketch for the bracket-support "R" in the "3d device"?

A. Wasn't any sketch made. I had asked Thomas to make something to go round there to rest a man's hand. I think that he just took a piece of iron and forged it out.

x-Q. 348. Who made the sketch for the spring stitcher—

A. That was—

10

x-Q. 349. "AA" in the "3d device"?

A. That was handled in about the same way: taking a stitcher and asked him to put a spring in there to relieve—or, rather, so there would be some give and go to it.

x-Q. 350. Did you tell Thomas where to fasten the bracket "R"?

A. Yes.

x-Q. 351. In rotating the core by hand for the high²⁰ speed in the "3d device," was it turned to the right, that is, clockwise?

A. No; it was turned to the left, toward you.

x-Q. 352. So that the part of the core or tire adjacent the bracket "R" was moving downwardly?

A. Downwardly, yes.

x-Q. 353. I understand the brake mechanism in the "3d device" is the same as in the "2d device"?

A. Yes, just the same. The brake for the tension is 30 the same.

x-Q. 354. What kind of a roller was in this part "AA" in the "3d device"?

A. Standard stitcher-roller.

x-Q. 355. Did it have a fairly sharp edge?

A. Was a sharp edge.

x-Q. 356. Did it score the fabric?

A. It did.

x-Q. 357. Badly?

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A. In places very badly.

x-Q. 358. Was that true in the operation of the "2d device"?

A. Yes.

x-Q. 359. Did the stitcher in the operation of the "3d device" score the fabric as badly as in the operation of the "2d device"? 10

A. It did.

x-Q. 360. Who made the tires on the "3d device"?

A. McDonald.

x-Q. 361. Any one help him?

A. There was a helper, simply a roustabout, helped on any work was necessary.

x-Q. 362. Do you remember his name?

A. Don't remember who he was.

x-Q. 363. Could you say about how many tires were 20 made on the "3d device"?

A. No, I couldn't.

x-Q. 364. Do you know whether any of them were commercial tires?

A. They were—as I say, a few of them would be taken out that we didn't tear down, were taken out and practically torn down and rebuilt by hand.

x-Q. 365. So that this "3d device" was not really a device for producing commercial tires?

30 A. No, it was not—an experiment.

x-Q. 366. As to the "4th device," did McDonald make the tires that were made on it?

A. Yes.

x-Q. 367. Did he have any helper, that you remember?

A. Nothing but this roustabout.

x-Q. 368. Did anybody other than Thomas, so far as you remember, make any parts for the "4th device"?

A. I couldn't answer that.

40 x-Q. 369. You don't remember any?

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A. I don't remember whether there was any one helped him make any of the stuff. Probably was.

x-Q. 370. When the crank was turned by hand for the purpose of stretching the fabric on in the operation of the "4th device," what happened to the belt drive for the high speed?

A. The belt drive was thrown off. Take and throw it off before you would use the stretch.

x-Q. 371. And put the belt back on again for the high-speed drive? 10

A. When you wanted the high speed.

x-Q. 372. What can you say about the character of the tires made on the "4th device"?

A. Handled about the same way as the other devices.

x-Q. 373. Were the tires of about the same quality as those made on the "3d device"?

A. About the same quality. Tore most of them down, patched up the rest. 20

x-Q. 374. Who made the suggestion for the belt drive?

A. Thomas made it.

x-Q. 375. Do I understand that, in regard to the "5th device", you applied an electric-motor drive for the purpose of enabling you to get variations in the high speed?

A. Yes, sir.

x-Q. 376. Was there any other reason for that?

A. No.

x-Q. 377. Would it not have been simpler and cheaper to have used a stepped pulley, or two stepped pulleys, in the belt drive shown in the "4th device"? 30

A. I don't think you could have got the variation.

x-Q. 378. You understand by a "stepped pulley" I mean a pulley having several different diameters?

A. Ordinary stepped pulley with two or three diameters.

x-Q. 379. Do you mean that the difference in the speeds between the different diameters would be too great? 40

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A. I don't know.

x-Q. 380. That's your idea?

A. That's my idea.

x-Q. 381. What variation in speed were you able to get by the electric motor in the "5th device"?

A. There was considerable. I don't know the exact
10 r.p.m. of the lowest speed or the highest.

x-Q. 382. Can you approximate it?

A. I would say it was along 80 or 85 was the highest.

x-Q. 383. And the lowest was about what?

A. Well, didn't use it any more than—the lowest would be probably between 70 and 85.

x-Q. 384. That variation you obtained by the rheostat you have mentioned?

A. Yes, starting rheostat.

x-Q. 385. What can you say as to the quality of the
20 tires produced on the "5th device"?

A. Very poor yet.

x-Q. 386. Did McDonald make them?

A. He did.

x-Q. 387. Who made the suggestion for the electric-motor drive?

A. I did.

x-Q. 388. Who made the suggestion for this double stock-roll arrangement in the "6th device"?

30 A. I did.

x-Q. 389. Who made the sketch for it?

A. I couldn't say. I don't know who made the sketch for it.

x-Q. 390. You are sure that you made that suggestion?

A. Absolutely!

x-Q. 391. And do you remember suggesting it to some person?

40 A. It came about by our continually having to take

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a roll off the single machine, and put another roll on, to cross the ply.

x-Q. 392. That was the reason?

A. That was the reason.

x-Q. 393. Do you remember to whom you made the suggestion of the double arrangement?

A. No, I do not.

x-Q. 394. Do you know who made the device itself, this double bracket? 10

A. I think that Thomas did the machine work.

x-Q. 395. That's the same Thomas—

A. Same Thomas.

x-Q. 396. To whom you have referred? But you don't recall whether you made the suggestion directly to him, or not?

A. No, I do not.

x-Q. 397. Did you suggest the treadle "G"? 20

A. It came about in the experiment with it, some way to hold that from flopping over when the stretching process was on.

x-Q. 398. Did you suggest that device, and for that purpose?

A. I wouldn't say whether I did, or not.

x-Q. 399. Did you suggest the connection "CD"?

A. Yes.

x-Q. 400. That specific suggestion came from you? 30

A. Yes, sir.

x-Q. 401. What held this part "B" up?

A. Had a spring on it.

x-Q. 402. Where did the spring work?

A. Underneath the—on the rod that goes up. Had a dog on the stand, and the spring would—**this rod** went through a hole, and then between this forged heavy square piece, and there was a spring put on (indicating).

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x-Q. 403. So that the treadle "G" would be held up by the spring, and be depressed by the foot?

A. Yes, when you wanted to turn it over.

x-Q. 404. What happened to the belt drive in both the "5th" and "6th" "devices" when the hand-crank was used?

A. Took the belt off.

10 x-Q. 405. How about the tires made on the "6th device;" were they any better than those made on the "5th"?

A. No, no better.

x-Q. 406. Was the high speed in the "6th device" the same as in the "5th"?

A. About the same.

x-Q. 407. In "Sketch 7" who made the tongs "S"?

20 A. Charley Wattleworth made the sketch,—draftsman; a man named McBride, a foreman of the Blacksmith Shop, forged them out.

x-Q. 408. Mr. Wattleworth is where now?

A. He is in Akron.

x-Q. Is he working for the Goodyear Company.

A. He is not.

x-Q. 410. Where is he working?

A. I think he is with the Falls Tire Company.

x-Q. 411. He was a draftsman with the Goodyear Company in 1907?

30 A. Yes.

x-Q. 412. What was Mr. McBride's first name?

A. Martin.

x-Q. 413. Is he with the Goodyear Company now?

A. He is.

x-Q. 414. What is his position?

A. Foreman of the Blacksmith Shop.

x-Q. 415. This part "R" in "Sketch 7" is vertically adjustable in the stand, is it not?

40 A. Yes.

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x-Q. 416. That's what you meant by referring to it as adjustable in your direct testimony?

A. Not in this instance.

x-Q. 417. What did you mean?

A. I didn't refer to it in this—as I remember, in this instance.

x-Q. 418. I think you mentioned this bar on which the tongs were designed to rest as an adjustable one. 10

A. Yes, could be worked up and down; yes, that's true.

x-Q. 419. That's the only adjustment it had?

A. That's the only adjustment.

x-Q. 420. Its vertical adjustment in its stand?

A. Yes, sir.

x-Q. 421. What was the purpose of that adjustment?

A. To get the tongs in different positions.

x-Q. 422. With respect to the height of the core? 20

A. Just the height of the core.

x-Q. 423. Did you find, in using the device of "Sketch 7", the proper position of the spinning-rollers or stitchers with respect to the core? I mean the proper position as to height?

A. No; did not.

x-Q. 424. At what position with respect to the core in a vertical direction did you use the spinning-rolls of "Sketch 7"? 30

A. I don't remember what height that was.

x-Q. 425. Who operated this device of "Sketch 7"?

A. McDonald.

x-Q. 426. Do you remember any one else that helped him?

A. No.

x-Q. 427. Who made the adjustable part "R"?

A. As referred to; McBride made it.

x-Q. 428. Who suggested that that adjustable part "R," and its stand, be made? 40

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A. Why, I think McDonald did.

x-Q. 429. The fabric-support and the brake in the device of "Sketch 7" are the same as the "6th device"?

A. Yes.

x-Q. 430. I note that, in the little plan-view of "Sketch 7," the part "R" seems to be at an acute angle to the
10 plane of the core. Is there any reason for that?

A. To keep the tongs from tilting.

x-Q. 431. Who suggested turning it to that angle?

A. I don't know.

x-Q. 432. Was the high speed of "Sketch 7" about the same as the "6th device"?

A. About this time we began to change the pulley diameter on the motor, getting a little higher speed.

x-Q. 433. What high speed did you get in "Sketch 7"?

20 A. Along 90, 95.

x-Q. 434. When was this? Do you remember what month of 1907?

A. No, I couldn't tell you.

x-Q. 435. As to "Sketch 7a," who suggested the arrangement for holding four rolls of fabric?

A. The four rolls of fabric came about in—came back from the Tire Room. There was so much waste on the tires they were making there, after they would start them on here,—there was so much waste the suggestion
30 was started over there that we cut down on the fabric. Therefore, the first two plies to go on the core should be narrow, and the other plies would be wide. And that check was made by somebody in the department, who asked that some way we cut down those first two plies; and that added the other two rolls of fabric to the head.

x-Q. 436. Do you remember who it was suggested the adding the other two rolls to the head?

A. The suggestion to some way to cut down the
40 amount of fabric we were using; but who that suggestion

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came from I don't know; but, when the suggestion came in, we had a sketch made of it, of one with four on.

x-Q. 437. Who made that sketch?

A. I think Charley Wattleworth.

x-Q. 438. Now, this "Sketch 7a" has a take-up roll "G" for the muslin liner.

A. To take the muslin liner off.

x-Q. 439. How could that work in connection with 10 the three rolls that are shown as spaced from it?

A. That roll would come off.

x-Q. 440. The roll "G," you mean?

A. This little wood roll that took up the liner, you would pull it off, lay that aside. Then, when it came over again, you put another wood roller in it and turn the liner over.

x-Q. 441. You would put a little roller "G" on its axle each time you brought one of the fabric rolls into position? 20

A. Yes, sir.

x-Q. 442. Well, did you cut the liner when you took the roll "G" off after it had been used?

A. The liners were in short lengths; and sometimes we had to roll back to get it; and then the boy, somebody, that helper there, would take it and wind it up again on the other roll.

x-Q. 443. I meant to ask you about the quality of the tires made on the device of "Sketch 7." Were they any 30 better than the tires of the "6th device"?

A. Very poor. Still was very poor.

x-Q. 444. You spoke about the plan-view of the gearing in "Sketch 7a" as being out of proportion. Do you remember what the proportions of those gears, "R," "S," "M," and "N," were?

A. No, I do not.

x-Q. 445. You don't remember, then, the ratio of the high and low speed in that device?

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A. The low speed was something along 10 or 12, and the high speed was along 85 or 90.

x-Q. 446. Was the power obtained from an electric motor?

A. Yes.

x-Q. 447. What is meant by this little diagrammatic figure near the top of "Sketch 7^a"? Does that mean the
10 drive to the jack-shaft?

A. On the floor there was a jack-shaft had a clutch on it and a pulley, straight pulley. From the motor it went to here, and then from this clutch it went up to this pulley on the drive for the machine.

x-Q. 448. Then on this little diagrammatic sketch the lefthand circle is the electric-motor pulley?

A. Yes.

x-Q. 449. The two center circles are the jack-shaft
20 and pulley?

A. Jack-shaft, pulley, and clutch.

x-Q. 450. And the righthand circle——

A. Is the pulley on the drive——

x-Q. 451. For chuck?

A. Yes, sir.

x-Q. 452. What size of tires did you make on these first eight devices?

A. 3½ clinchers.

x-Q. 453. All the same size?

30 A. Yes, sir.

x-Q. 454. What was the diameter? Do you remember?

A. Think it was 30 inch. Some were 28.

x-Q. 455. In connection with the device of "Sketch 7^a" did you have the spinning-rolls arranged as shown in the "Sketch 7"?

A. No; I hadn't them on at all. Was just working out speeds, stretching on.

x-Q. 456. Then you did not make any tires on the
40 device of "Sketch 7^a"?

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A. I did eventually. I afterwards put a device on to.
 x-Q. 457. You are referring now to "Sketch 7^b"?

A. "7^b."

x-Q. 458. But you tried the device of "Sketch 7^a"——

A. Simply for stretching.

x-Q. 459. Simply for stretching? Do you remember when that device of "Sketch 7^a" was made?

A. No, I don't.

10

x-Q. 460. In the apparatus of "Sketch 7^b" the fabric rolls and their supports, and the take-up roll, is the same as "Sketch 7^a"?

A. Yes. It is the same.

x-Q. 461. The drive for the core is the same?

A. It is the same, with one exception,—that we had speeded it up a little, speeded the high speed up a little.

x-Q. 462. What speed did you get for the high speed in "Sketch 7^a"?

20

A. Something along about a hundred.

x-Q. 463. And what was the low speed?

A. About 9 or 10.

x-Q. 464. Who made the suggestion for this slide marked "M" in "Sketch 7^b"?

A. I did.

x-Q. 465. Who made the sketch for it?

A. Charley Wattleworth.

x-Q. 466. What did you say to him about that?

30

A. I don't know the detail of what I said to him. I probably made some pencil sketches and discussed it with him to make a slide for it.

x-Q. 467. Did you tell him to make an undercut slide?

A. What do you mean—"an undercut slide"?

x-Q. 468. What kind of a slide do you call that of "Sketch 7^b"? I want to use your terminology, so you will understand it.

A. Why, it's what you call a "V" slide.

40

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x-Q. 469. Did you tell Wattleworth to make a "V" slide?

A. No, I didn't.

x-Q. 470. Can't you tell me in general what you told him about that?

A. Simply told him to make a sketch of a holder, a pedestal holder; and wanted an adjustable slide made on
10 it. He worked out the detail.

x-Q. 471. Then the part on which you made this sketch was the pedestal on which the slide "M" is mounted?

A. Yes.

x-Q. 472. And you told him you wanted an adjustable holder on it?

A. Yes, adjustable slide.

x-Q. 473. Did you tell him how it should be made adjustable?

20 A. No.

x-Q. 474. Did you describe to him the lever arrangement for moving it?

A. No, I did not.

x-Q. 475. Did he design that himself?

A. He designed that himself.

x-Q. 476. From this "Sketch 7^b" it would appear that the pedestal which holds the slide "M" is itself slidable.

A. It is.

30 x-Q. 477. On a lower part.

A. It is.

x-Q. 478. Who made that suggestion?

A. He did.

x-Q. 479. Wattleworth did?

A. Charley Wattleworth. Came about in his detail—when he started to draw it up to show for different diameters of core; it would have to move in and out.

x-Q. 480. How were the tongs which carry the spinning-rollers mounted on this slide "M" in "Sketch 7^b"?

40 A. Just a cap-screw right through.

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x-Q. 481. That acted as one pivot?

A. One pivot for the two.

x-Q. 482. Was there any spring on the tongs?

A. Yes. Spring on the rear to pull them together.

x-Q. 483. Like that shown—

A. Like that sketch there.

x-Q. 484. To the right, at the bottom of "Sketch 8"?

A. To the right, yes, sir,

10

x-Q. 485. Who made the suggestion for that spring?

A. Charley Wattleworth.

x-Q. 486. How high were the tongs mounted with respect to the core in "Sketch 7^b"?

A. In that machine I couldn't tell you just what they were.

x-Q. 487. Do you remember whether they were above or below the center of the core?

A. I couldn't tell you. They were somewhere around the center. I don't know whether they were above or below.

20

x-Q. 488. Did you make tires on the device of "Sketch 7^b"?

A. Yep.

x-Q. 489. Were they any better than the tires made on the device of "Sketch 7^a"?

A. They were just beginnig to get a little better. Yes, they were a little better than that.

x-Q. 490. In the device of "Sketch 7^b" did you have the support gearing and clutch arrangement shown to the left at the bottom of "Sketch 7^a"?

30

A. Yes.

x-Q. 491. Do you know whether or not any tires made on the machine of "Sketch 7^b" were completely finished?

A. No, I do not.

x-Q. 492. Who made the tires on that machine?

A. The same man, McDonald.

x-Q. 493. Up to this time had any machinist or tire-

40

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maker, that you can remember, other than those you have named, worked on these machines?

A. Austin Thomas, the machinist, worked on them; and, I think, at this stage Al Shaw.

x-Q. 494. Is that Albert Shaw?

A. Albert Shaw.

x-Q. 495. Where is he now?

10 A. In Akron.

x-Q. 496. In the employ of what concern?

A. Goodyear Tire & Rubber.

x-Q. 497. What position does he hold?

A. I think he is in the Experimental Department. He may be in the Patent Department. I couldn't say.

x-Q. 498. Would you say that the tires made on the machine of "Sketch 7^b" were salable and usable tires?

A. No.

20 x-Q. 499. Did you tell me what the high speed was in the machine of "Sketch 7^b"? If not, will you say about what it was?

A. I judge about 95.

x-Q. 500. In the device of "Sketch 8" you show a screw for feeding the slide "M". That is a high-speed screw, is it not?

A. Yes.

x-Q. 501. Who suggested that?

30 A. That came out in the detail for the drawing on that head. Wattleworth worked that detail out.

x-Q. 502. And this arrangement of holes for receiving the handle "X"—who made that suggestion?

A. That was put in—I think Wattleworth did it.

x-Q. 503. Did you find that to be a valuable or important feature?

A. Yes, I did. It gave us a variation of feeding it in.

x-Q. 504. And it really would work to that effect?

A. A man would work it that way.

40 x-Q. 505. So that it would make the inward feed more

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accurate than if it were simply left to the man's judgment?

A. Matter of speed in changing speed.

x-Q. 506. Did it make the rate of inward feed of the slide "M" more accurate?

A. Low speed made it a little lower; that is, the inside made it a little lower—the outside made it a little lower.

x-Q. 507. In other words, if I understand you correctly, it was better than simply leaving the handle in the one place and leaving the rate of inward feed to the workman's judgment?

A. Yes.

x-Q. 508. About when was that machine of "Sketch 8" made?

A. It was about the middle of the summer.

x-Q. 509. Of 1907?

A. Yes.

x-Q. 510. Are you sure it was before 1908?

20

A. Yep.

x-Q. 511. Up to this time had Mr. Frank R. Chamberlain worked on any of these machines?

A. No.

x-Q. 512. How about Mr. Smith?

A. I don't remember ever Smith at that time.

x-Q. 513. Had a Mr. William Kreuder worked on it up to that time?

A. No. He was foreman. He wouldn't have any reason to be near it. He was foreman of the Mill Room.

x-Q. 514. And he had nothing to do with these devices of the sketches we have so far discussed?

A. Nothing whatever at all.

x-Q. 515. Why did you put on the leaf-springs "S" shown in "Sketch 9"?

A. Well, it was simply a form of pressure.

x-Q. 516. Well, who suggested changing from the spiral spring to the leaf-spring?

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A. The spiral spring of the tongs to the leaf-spring I think I suggested myself.

x-Q. 517. And who suggested pivoting the arms which carried the spinning-rollers separately, as in "Sketch 9," instead of on one pivot, as in "Sketch 8"?

A. There was a template made for those arms.

x-Q. 518. Of "Sketch 9"?

10 A. Yes. In fact, several templates were made for different types of arms in the Drafting Room, cut out of pasteboard; and I believe that Wattleworth suggested those pivoted in that position.

x-Q. 519. As shown in "Sketch 9"?

A. In "Sketch 9."

x-Q. 520. Do you remember the names of any of the other draftsmen who worked on those templates?

A. No, I don't remember them.

20 x-Q. 521. Can you tell me how the pedestal which supported the bracket "M" in "Sketches 7^b," "8," and "9" was secured in any desired adjustment on the part on which it would slide?

A. There was what was known as a "gib." It was wider than necessary; and a piece slid in there, and then they would screw a steel "gib" in there, then set-screws along the side there and tighten it up.

30 x-Q. 522. In "Sketch 10" there is a coil-spring, again, on the arms which carry the spinning-rolls. Who suggested putting that in place of the leaf-springs "S" which you suggested, as shown in "Sketch 9"?

A. I did.

x-Q. 523. Why did you make that change?

A. Had more tension.

x-Q. 524. And who suggested the provision of vertical adjustment of the table "M" shown in "Sketch 10"?

A. I did.

40 x-Q. 525. That was merely for the purpose of experimenting, was it not?

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A. Yes, experimenting and getting the position to run the rolls in.

x-Q. 526. Were tires made on the machine of "Sketch 8"?

A. Yes, a few.

x-Q. 527. Were they better than the tires made on the machine of "Sketch 7"?

A. About the same. 10

x-Q. 528. How about the machine of "Sketch 9,"—were tires made on it?

A. Yes.

x-Q. 529. Were they any better than the tires made on—

A. They were getting better on that machine; better tires made on that than the previous ones.

x-Q. 530. That is, the tires made on the machine of "Sketch 9" were better than those made on the machine of 20 "Sketch 8"?

A. Yes.

x-Q. 531. How about the high speed of the machine of "Sketch 8"?

A. That was the same as the previous machine.

x-Q. 532. And how about the high speed of the machine of "Sketch 9"?

A. We had run that speed up. That speed along that time was along 110, 112, 115. 30

x-Q. 533. How about "Sketch 10," the high speed of that machine?

A. That was, as I say, about 110—that's about 110 or 115.

x-Q. 534. Do you know whether any tires made on the machine of "Sketch 10" were completed and put into use?

A. I think there was a few of them.

x-Q. 535. Would you say those tires made on that device were salable and usable tires? 40

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A. They were used on tests; put out and tested; they weren't sold.

x-Q. 536. Do you know what they showed on test?

A. No, I don't remember. They showed up fairly well.

x-Q. 537. Would you say they were salable tires?

10 A. They would have been salable tires; but they used them on tests.

x-Q. 538. Did that apply to the tires of the machine of "Sketch 8"?

A. No.

x-Q. 539. Can you say why the tires of the machine of "Sketch 10" were salable and those of the machine of "Sketch 8" were not; in other words, can you account for the difference in quality?

20 A. We were able to raise and lower that table to get it in more even, to get away from the wrinkling which the—which would come about by the spinning-rolls not being in the right position.

x-Q. 540. Then, if I understand you correctly, the improvement in the product was due to the provision of this vertical adjustment of the table "M"?

A. That with the higher speed.

x-Q. 541. Of rotation of the core?

A. Of rotation of the core.

30 x-Q. 542. Who made the experiments with this vertical adjustable table shown at the bottom to the left in "Sketch 10," to see what should be the proper height for the spinning-rolls with respect to the core?

A. I supervised it with Thomas and McDonald.

x-Q. 543. Did you stand directly over those tests, or did you let them make them and report to you?

A. Stood directly over them and saw it done.

40 x-Q. 544. And how long did you experiment before you got the proper height for the spinning-rolls?

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A. Well, don't know what. Was quite a bit of time devoted to it.

x-Q. 545. Several days?

A. Yes.

x-Q. 546. Is that a very important point for the successful operation of the machine?

A. It's one of the important points.

x-Q. 547. Did you discover that fact, and what the proper point was, in the year 1907? 10

A. Yes.

x-Q. 548. In "Sketch 11" the mounting for the spinning-rolls is somewhat different from that shown in "Sketch 10." Do I understand that you suggested this?

A. I suggested widening them out, shortening them, and putting them forward on the table.

x-Q. 549. As I understand your last answer, you mean to say you suggested spacing the pivots for the arms which carried the spinning-rolls further apart; you suggested shortening the arms themselves;— 20

A. Yes.

x-Q. 550. And you suggested placing the pivots nearer the front of the table "M"?

A. Yes.

x-Q. 551. Why did you use leaf-springs in the arrangement shown in "Sketch 11," instead of coil-spring as shown in "Sketch 10"? 30

A. Couldn't get the pressure—couldn't get quite the pressure with the springs across here (indicating); and they would interfere with the tire. If the spring was in there enough to pull that together, coil-spring enough to pull that together, it would kill the tire; and had to get on the outside.

x-Q. 552. I understand you mean you had put a coil-spring between the two arms in the machine of "Sketch 11" so as to draw them together; you would not have the 40

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proper pressure, and the spring itself might interfere with the core or tire?

A. Not so much the proper pressure as it would interfere with the tread of the tire.

x-Q. 553. The spring itself might contact with the tread of the tire?

10 A. To get a strong enough spring on there to get a pressure to bring the rolls against the side of the tire, the spring would have to be so far forward that it interfered with the tread of the tire.

x-Q. 554. In other words, for the spring to have sufficient leverage in acting on the arms, it would have to be so far away from the pivots of the arms that it would have to interfere with the tire?

A. Yes.

20 x-Q. 555. Did you find those leaf-springs "S" of "Sketch 11" satisfactory?

A. No.

x-Q. 556. Were any tires made on this machine of "Sketch 11"?

A. They were.

x-Q. 557. Were any of them finished and tested?

A. Finished and tested.

x-Q. 558. Were they good tires?

A. Yes.

30 x-Q. 559. Now, when was this machine made, "Sketch 11"?

A. Well, it was just—I would say it was along in August.

x-Q. 560. 1907?

A. 1907. Possibly July. I am not sure. July or August. Some place in there.

x-Q. 561. There were no other distinctions between the machine of "Sketch 11" and the machine of "Sketch 10" except those which you have mentioned in connection with the tire?

40

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tion with the stitcher mounting; is that right? Is that right?

A. Yes, that's correct.

x-Q. 562. Now, in "Sketch 12" the change from "Sketch 11" is in the arrangement of spring pressure for the arms carrying the stitchers; is that right?

A. That's right.

x-Q. 563. Who suggested that particular arrangement shown in "Sketch 12"? 10

A. I did.

x-Q. 564. Who made the sketch for it?

A. Wasn't any sketch made.

x-Q. 565. To whom did you suggest it?

A. Aust Thomas.

x-Q. 566. Do you remember about what you said to him?

A. Suggested to put a spring tension instead of the 20 flat spring. It was breaking, getting out of order. Put a coil-spring and compression against it.

x-Q. 567. Did you suggest putting the guide-rods inside of the springs "S" in "Sketch 12"?

A. Yes. It wouldn't work, if it wasn't.

x-Q. 568. And you mentioned that to Thomas?

A. Yes.

x-Q. 569. Did you tell him to what part of the arms carrying the stitchers those springs should be pivoted? 30

A. Yes, about half way.

x-Q. 570. Half way between the pivot of the arm and the stitchers?

A. Stitchers.

x-Q. 571. What is the reason for this sketch at the bottom of the drawing entitled "Sketch 12" which shows another form of stitcher-arm?

A. This was made first, and this is second.

x-Q. 572. The form shown in the sketch at the bottom 40

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was made first; and the form shown in the sketch above was made second?

A. Second.

x-Q. 573. Who suggested the form shown in the sketch at the bottom?

A. I did.

10 x-Q. 574. Why did you go back to the form of stitcher-arm shown in "Sketch 10," instead of adhering to the form of stitcher-arm shown in "Sketch 11"?

A. Wanted to try whether it would be easier, with a longer fulcrum on the back to open it to go in to go over the ball of the tire.

x-Q. 575. You thought that the longer arms might make it easier for the workman to separate the stitchers?

A. Yes. We had them there, and tried them out that way.

20 x-Q. 576. Were tires made on the machine of "Sketch 12"?

A. Yes.

x-Q. 577. Were they good tires?

A. Pretty fair tires.

x-Q. 578. Were they better than the tires made on machine of "Sketch 11"?

A. About the same.

30 x-Q. 579. Would you say they were salable, usable tires?

A. They were usable tires.

x-Q. 580. What defects, if any, did they have?

A. They weren't as uniform—

x-Q. 581. In what respect?

A. As—not uniform; there were a great deal of hand work in finishing.

x-Q. 582. And that applies also to the tires of "Sketch 11"?

40 A. Yes.

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x-Q. 583. I mean by that, made on the machine of "Sketch 11"?

A. Wrinkles.

x-Q. 584. Wrinkles in the fabric, that had to be removed by hand?

A. Yes.

x-Q. 585. Required a great deal of hand work that had— 10

A. Not a great deal. They were getting better.

x-Q. 586. In "Sketch 13" you again show the leaf-springs. Why did you go back to those? I mean the springs "S"?

A. Simply experimenting back and forth, testing them out.

x-Q. 587. Did you find that the springs of "Sketch 12" were not entirely satisfactory?

A. They were better than the leaf-spring. 20

x-Q. 588. Then why go back to the leaf-spring in the machine of "Sketch 13"?

A. Simply more testing.

x-Q. 589. But you had already tested the leaf-springs shown in "Sketch 13" when you made the machine in "Sketch 11," had you not?

A. I had made it of certain materials and springs. Changed the temper, changed the material they were made out of; thought possibly they would work better.

x-Q. 590. What was the objection, if any, that you had 30 to the coil-springs shown in "Sketch 12"?

A. There was no great objections to them; just a matter of experimenting.

x-Q. 591. You thought that a leaf-spring made of some different material might be better?

A. Might be better.

x-Q. 592. Who suggested the arrangement of the tread-roll as shown in "Sketch 13"?

A. I did. 40

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x-Q. 593. How about the cutters?

A. I did.

x-Q. 594. And the bead-applying devices?

A. I did.

x-Q. 595. Did you make sketches of those?

A. Yes, there were sketches made. Wattleworth made the sketches. I made pencil sketches; Wattleworth made detail sketches.

10 x-Q. 596. You made pencil sketches of all three,—the tread-roll, bead-cutter, and bead-applying roll?

A. Yes.

x-Q. 597. And did you show how they should be arranged on the table?

A. No, I did not.

x-Q. 598. Who placed them on the table, or designed the arrangement?

A. I think Wattleworth placed them in their position.

20 x-Q. 599. When making tires on the devices prior to that shown in "Sketch 13," how did you roll down the tread part of the fabric?

A. There wasn't a great deal of rolling down to it. Was simply smoothing out little wrinkles, the air out of it; wasn't designed to roll it out at all.

x-Q. 600. How was that done before you had the tread-roll around the machine?

A. The amount of stretch we put on there, about
30 12%, would just go over, a little bit over, the round of the ball; and the tread-roll, if there were any wrinkles coming from contraction coming in would roll it out and roll out the air bubbles.

x-Q. 601. I am asking you what device did you use for rolling down the tread in the machines before you incorporated the tread-roll as shown in "Sketch 13"?

A. Oh! Did it by hand-roll, just a wide roll.

x-Q. 602. Tread-roll held in the hand of the operator?

40 A. Just in the hand of the operator.

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x-Q. 603. In "Sketch 14" when was the screw shown in Fig. 1 designed?

A. It was the first one we used.

x-Q. 604. About when was the screw shown in Fig. 2 designed?

A. The second one.

x-Q. 605. Who suggested the screw of Fig. 2?

A. I think I did.

10

x-Q. 606. Did you suggest the form of the thread and the pitch?

A. Yes.

x-Q. 607. How about the screw of Fig. 3? Who suggested the form of the thread and pitch of that?

A. They wanted to cut it down a little, and I think Thomas did.

x-Q. 608. How about the screw of Fig. 4? Who suggested the form of thread and pitch of that?

20

A. No. 3 was just a bit slow, and we went back to an eighth-inch pitch.

x-Q. 609. Who suggested that?

A. I did.

x-Q. 610. Are you sure you suggested that?

A. Yes.

x-Q. 611. Did you make a sketch, or did you simply say?

A. No, simply said send it back to No. 8 thread.

x-Q. 612. What was the advantage of the "V" thread over the square thread?

30

A. Well, in experiments you could cut that with a die, and the other was cut in a lathe; you had to cut the square thread in a lathe, and there wasn't much variation in the pitch; couldn't get much variation in the pitch, and you could get it in a "V" thread; it would go up and down on the pitch very easy.

x-Q. 613. That is, you could change the pitch of the "V" thread more easily than that of the square thread?

40

Will C. State for Plaintiff—Cross.

A. Yes; and there was a limit to the pitch on a "V" thread, as to the speed of it.

x-Q. 614. You mean "V" thread there?

A. No; I mean square thread.

x-Q. 615. The teeth on the screw of Fig. 4 seem to be wider than that of Fig. 3. Is that simply because of the pitch?

10 A. Yes; sixteenth narrower than the eighth; twice as many threads in 3 as there is in 4.

x-Q. 616. For a given length?

A. For a given length per inch.

x-Q. 617. Was the use of a "V" thread an important advantage over the use of a square thread?

A. Not particular.

x-Q. 618. But it was some advantage?

A. Some advantage; you could get a slower thread, if
20 you wanted to.

x-Q. 619. In "Sketch 15" do I understand the figure at the top, to the left, entitled "Hand stitcher-wheel," is intended to represent the ordinary hand stitcher-wheel in use prior to the beginning of your experiments?

A. Yes.

x-Q. 620. And the figure immediately to the right, with the same title, is intended to represent what?

A. A hand spinning tool that we made up on our hand spinning operations.

30 x-Q. 621. A special tool you made?

A. Simply—the special part of it was blunter edge.

x-Q. 622. Who suggested that, and when was it suggested?

A. I suggested it. It came about from the other creasing it so and cutting into the fabric in hand spinning operation.

x-Q. 623. To whom did you suggest it?

A. Aust Thomas.

40 x-Q. 624. What did you tell him to do?

Will C. State for Plaintiff—Cross.

A. Just to make up another spinning-roll with a blunter edge.

x-Q. 625. Is that all you said to him?

A. That's all.

x-Q. 626. The next figure, entitled "Machine stitcher-wheel," is intended to represent what?

A. A stitcher-wheel we were using on our first experiments on the tongs, and some of the subsequent experiments. 10

x-Q. 627. Was that made after the hand stitcher-wheel with the blunt edge?

A. Yes.

x-Q. 628. Why did you make the edge on this first machine stitcher-wheel narrower than the edge on the blunt hand stitcher-wheel?

A. We thought with the mechanically operated spinning-rolls that we could cover the surface with a little narrow one. We couldn't do it even with the broad one even by hand operation. 20

x-Q. 629. What do you mean, Mr. State, by "cover the surface"?

A. Of the tire in rolling it down.

x-Q. 630. You mean act upon all parts of the surface?

A. Act upon all parts of the surface.

x-Q. 631. And why did you make this first machine stitcher-wheel of dishlike form?

A. For the face of it to miss the fabric, the skirt of 30 the fabric.

x-Q. 632. Which face was towards the core—the flat one or the——

A. The lower face.

x-Q. 633. That is, the flat face?

A. The flat face was towards the core.

x-Q. 634. The next machine stitcher-wheel is like the one just mentioned, only the edge is blunter; is that correct? 40

Will C. State for Plaintiff—Cross.

A. Yes.

x-Q. 635. Why did you make it blunter?

A. It is blunter and it is ribbed to get more contact in pressing it on to the core, and more friction resistance to the skirt in getting the radial stretch in rolling it down.

x-Q. 636. Did the ribs run crosswise with the edge?

A. No; round with the edge.

10 x-Q. 637. Circumferential with the edge?

A. Yes.

x-Q. 638. How many ribs were there on the edge?

A. One.

x-Q. 639. Was that rib a little ridgelike?

A. Just a raise.

x-Q. 640. Rounded?

A. Rounded.

x-Q. 641. And how did that work?

20 A. Worked very well.

x-Q. 642. Was the width of the edge of this stitcher about the same as that of the blunt hand-stitcher?

A. A little bit less, just a fraction less.

x-Q. 643. Then why did you go to the last form of machine stitcher, which is shown as flat on both sides, with a blunt edge?

A. We was trying to get more clearance between the roll and the fabric.

30 x-Q. 644. And you used that because the bearing was not as long, or the hub not as long?

A. No. It cut down the hub,—the thickness; and tried to make it avoid, as I say, the skirt of the tire when it was turned back, when the core was revolving at high speed.

x-Q. 645. By making the hub shorter, the stitcher would be moved bodily further away from the core?

A. No; the fabric—it would be farther away from the fabric that turned out from centrifugal force, turned
40 out.

Will C. State for Plaintiff—Cross.

x-Q. 646. Was the edge of this flat machine stitcher wider than the edge of the machine stitcher shown immediately above it?

A. It was about the same.

x-Q. 647. Did the flat machine stitcher have a rib on its edge?

A. No; just round.

x-Q. 648. Why did you give up the rib? 10

A. Well, got the same effect. We didn't have to hollow it out. Got the same effect, less the extreme width.

x-Q. 649. You found you didn't need the rib on the edge; is that it?

A. No; I found that I didn't need this width. Yes. Could get along without the rib. Go flat through there, instead of recess.

x-Q. 650. Will you tell me again why the flat machine 20
stitcher would work without the rib, when you desired the rib on the form of machine stitcher shown immediately above it?

A. We thought that it would—in going down the side of where the core recesses quickly to the tongue, I thought possibly it would shear more on the side if it was flat, and, if I recessed it, it would relieve it a little.

x-Q. 651. What do you mean by the "recessed"?

A. See, where the dotted line shows?

x-Q. 652. Yes. 30

A. That is recessed into the stitcher. The material is cut out.

x-Q. 653. Then, if I understand you now, the machine stitcher shown in the second view from the bottom of "Sketch 15" had the rib as a depression instead of a raise?

A. No, it's raised; and it would be depressed away from it.

x-Q. 654. On both sides? 40

Will C. State for Plaintiff—Cross.

A. No, on one side.

x-Q. 655. On one side? Now, I understand you to mean that, in the machine stitcher shown in the second view from the bottom, the face which appears as a flat side was really somewhat concave?

A. No, it is not. The bead naturally—this is recessed back; naturally a line shown through there is the outside point of the bead. It was cut out inside there, turned in here.

x-Q. 656. Yes, I understand, just like that?

A. Yes.

x-Q. 657. That's what I mean by "concave".

A. Yes.

x-Q. 658. In other words, the side which appears to be flat was centrally depressed so as to leave a peripheral ridge extending in an axial direction?

20 A. Yes.

x-Q. 659. When you increased the speed of rotation of the core, was there more tendency for the stitchers to jump at the plies of the fabric?

A. In the hand operation that was true.

x-Q. 660. Was there that tendency in the machine operation?

A. No.

x-Q. 661. Why was there not that tendency in the machine operation?

30 A. It was done more mechanically. Wasn't allowed to get out of line; controlled better, and wouldn't act that way.

x-Q. 662. What machine are you referring to in your last answer?

A. The last machine in the sketch.

x-Q. 663. That would be the machine of "Sketch

—"

A. This one here.

40 x-Q. 664. "12," I suppose, you mean?

Will C. State for Plaintiff—Cross.

A. Yes; "12" is right.

x-Q. 665. And also "11" and "10"?

A. No. It would be in "11." It was better in "11."

x-Q. 666. How about "10"?

A. Not so good.

x-Q. 667. Was there much tendency to jump at the plies in the machine of "Sketch 10"?

A. No.

x-Q. 668. Can you say about what was the high speed in the last machine you made and used in the attic; I mean the high speed of rotation of the core?

A. The last machine? Are you referring to machine went on the floor?

x-Q. 669. I am referring to the one you said you used for making tires up in the attic.

A. The last machine was made in the attic—

x-Q. 670. In the latter part of 1907.

A. That was put on the floor? No, I don't remember that speed.

x-Q. 671. Can you give it to me approximately?

A. No, I couldn't; I don't remember just what that speed was. It was very high; I remember that.

x-Q. 672. Was it over a hundred r.p.m.?

A. Yes, it was over a hundred.

x-Q. 673. Was it over a hundred and fifty r.p.m.?

A. I can't say.

x-Q. 674. Why is it you can't remember that commercial machine and you can remember the experimental ones?

A. Well, we were changing motors on that commercial machine; and, as I say, we just kept changing motors in the gear and running speeds up in the attic until that hard fabric could be handled. There wasn't much attention paid to what that speed was.

x-Q. 675. Did you decide or determine in 1907 what was the most desirable high speed for rotation of the core? 40

Will C. State for Plaintiff—Cross.

A. I know the action on fresh fabric was along 120, 125.

x-Q. 676. You decided that for yourself?

A. Decided that in the operation of the machine.

x-Q. 677. You decided that in 1907?

A. Well, it was the latter part of 1907.

10 x-Q. 678. Did you change your view in that respect in the year 1908?

A. We changed our view from extreme high speed it had gotten to when we were getting fabric fresh from the calenders.

x-Q. 679. What I meant by the last question, Mr. State, was, did you, during the year 1908, still believe that about 120 or 125 r.p.m. was the best high speed for the core when using fresh fabric?

A. I don't know whether that was the time, or not.

20 x-Q. 680. You say that you determined that in the latter part of 1907?

A. I don't know, I am not positive what speed it was.

x-Q. 681. Did you, at any time during the year 1908, determine or decide what, in your opinion, was the best high speed for rotation of the core in the machine when using fresh fabric?

A. I don't know what that was now.

x-Q. 682. I am asking if you did determine any?

A. I didn't—no, I did not.

30 x-Q. 683. Did you have any idea what was the best?

A. No, I did not.

x-Q. 684. Have you ever determined what is the best high speed for rotation of the core?

A. I know that there were a great deal of experiment done on the speeds. For instance, one day they could have fresh fabric; then a rule was that the fabric ought to age at least three days; then you would get it stiff; and there was a great deal of experimenting back and

40 forth.

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x-Q. 685. When was that?

A. That was when the machine was put in to work commercially.

x-Q. 686. 1908?

A. 1908.

x-Q. 687. Well, did you make any experiments yourself for the purpose of determining what was the most desirable high speed for the core, in the year 1908? 10

A. There was some experiments, but I don't know what it was.

x-Q. 688. And you haven't any idea of what was determined?

A. I haven't any idea. That's too—those things were changed back and forth, and I couldn't answer, I don't know what it was.

x-Q. 689. Can you tell me within 50 revolutions?

A. I wouldn't attempt to. 20

x-Q. 690. Do you know what was the reduction in high speed of the core made when the machine was removed from the attic, where the dry fabric was used, down to the floor, where the fresh fabric was used, in 1907 or 1908?

A. I don't know, don't remember.

x-Q. 691. Can you approximate it?

A. No, I could not.

x-Q. 692. You haven't any idea? 30

A. I haven't any idea what it was.

x-Q. 693. Have you any idea what the high speed was of the machine last used in the attic?

A. No, I have no idea of the last speed it was on.

x-Q. 694. You couldn't tell me within 50 or a hundred revolutions?

A. I wouldn't attempt to guess at it.

x-Q. 695. Did the experiments which you have described prove to you that the rate of high speed of rota- 40

Will C. State for Plaintiff—Cross.

tion of the core was an important factor in the production of satisfactory tires?

A. It was.

x-Q. 696. But you do not know what high speed you determined on for the commercial machine when you finished your experiments?

A. No, I can't tell you.

10 x-Q. 697. Did you determine that high speed?

A. No.

x-Q. 698. I am not asking you now what it was, but I mean were you the one who decided upon the high speed?

A. No.

x-Q. 699. Who was that?

A. I don't know.

20 x-Q. 700. Did you find out, as a result of your experiments, that the machine would not produce salable or usable tires if the stitcher-arm was pressed in only by the strength of the operator and no spring used; I mean pressed in laterally towards the core?

A. Pressed in against the side of the core?

x-Q. 701. That's what I mean.

A. You could have pressed it in hard enough to have made a tire that would have been all right.

x-Q. 702. Without the use of a spring?

A. Without the use of a spring.

30 x-Q. 703. Was the provision of a spring for this purpose an important feature of the machine?

A. It took the work off the man, and helped him to easier do his work.

x-Q. 704. And it made the stitchers act more uniformly, did it not?

A. It would act more uniformly.

x-Q. 705. So it was an important improvement over the mere pressing in of the stitcher by the hand of the operator?

40 A. Yes.

Will C. State for Plaintiff—Cross.

x-Q. 706. You spoke in your direct-examination of more pressure against the side of the core being desirable near the bead portion. Did you mean to limit that statement to instances in which the dry fabric was used, or does that fact apply even when fresh fabric was used?

A. The springs naturally—all the springs that were used naturally weren't as active as directly on the rolls when the core got narrower than when they were on the ball of the core, when they would add a little pressure by the hand to it. 10

x-Q. 707. Was that pressure intended to be enough to compensate for the loss of the spring pressure, or was it intended to make the total pressure at the bead section greater than that exerted at any time by the spring?

A. It added simply a little to the spring where it was narrow, where the tongue of the core was narrow.

x-Q. 708. Well, would you say that the actual pressure of the stitchers against the fabric on the sides of the core was greater under the influence of the springs and the hands of the operator at the bead section than higher up on the core? 20

A. No, I wouldn't say it was.

x-Q. 709. About the same?

A. About the same.

x-Q. 710. Did your experiments show that it made any difference in the operation of the stitchers whether the core was rotated in one direction or the other? 30

A. Yes.

x-Q. 711. Which direction was the proper one?

A. Toward the stitchers.

x-Q. 712. That is, so that the part of the core upon which the stitchers acted was moving downwardly with respect to the stitchers?

A. The core was moving downward rotating the stitchers—that is, over.

x-Q. 713. Is it not correct that you mean that the 40

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7

Will C. State for Plaintiff—Cross.

part of the core upon which the stitchers were operating was moving downward?

A. Yes.

x-Q. 714. Did it make a very great difference if the core was rotated in the opposite direction?

A. Never tried it.

x-Q. 715. When you spoke of the flat springs for pressing on the stitcher-arms, you mentioned that they were frequently "getting set." Do you mean by that losing their spring?

A. Losing their spring.

x-Q. 716. Would the screw shown in Fig. 3 of "Sketch 14" advance the stitchers so that they would properly lay down the fabric?

A. A little slow, but it would lay it down.

x-Q. 717. It would do the work, but it would do it more slowly than a higher pitch?

20 A. Yes.

x-Q. 718. Do you mean to say that stitching-rollers with plain bearings would be entirely unsatisfactory and worthless in the first commercial machine?

A. With high-speed rotation they would.

x-Q. 719. And what do you mean by "high-speed rotation," approximately?

A. I can't state just the speed; but I know that just the hand-rolls alone, along when it was running about 30 50, would stick the roll; it would dry out; didn't dare put any oil on it, and it would stick and slide.

x-Q. 720. So that a high speed of 120 would make them worthless?

A. I would say it would.

x-Q. 721. In the operation of your first commercial machine at a high core speed of about 120, would stitchers mounted in plain bearings be impracticable?

A. They wouldn't be impracticable, but would wear 40 out quickly.

Will C. State for Plaintiff—Cross.

x-Q. 722. They would do the work, but would wear out quickly?

A. Do the work; but would wear out quickly, wouldn't last any length of time at all.

x-Q. 723. Then do you mean to say that such rollers with plain bearings were not suitable for machine use?

A. They were not as good as the ball-bearing.

x-Q. 724. But they would work?

A. They would work.

10

x-Q. 725. Would they lay the fabric down as well?

A. I don't think it mattered.

x-Q. 726. Did you determine in your experiments any particular angle of the stitcher rollers, with respect to the plane of the core, that was best?

A. We experimented a great deal on the angle, but what the angle was itself I don't remember; I don't know the degree of the angle.

x-Q. 727. Who first suggested mounting the stitcher-rollers at a receding angle with respect to the plane of the core? ²⁰

A. That was determined by the attempt to roll the fabric down and clear the skirt. The angle was put out as far as it could be and avoid hitting the skirt, to get as much pressure direct on the side of the core as you could possibly get.

x-Q. 728. Who determined that?

A. That was determined in our experiments.

30

x-Q. 729. Who conducted those experiments?

A. Three of us. That is,—

x-Q. 730. That is,—

A. The machinist—

x-Q. 731. Thomas, Wattleworth, and yourself?

A. Who?

x-Q. 732. Thomas, Wattleworth, and yourself?

A. No; Thomas,—

x-Q. 733. McDonald,—

40

Will C. State for Plaintiff—Cross.

A. McDonald.

x-Q. 734. And yourself? What did you mean by referring to the desirability of having the stitchers have a certain frictional contact with the skirts of the fabric to give radial stretch?

A. To give radial stretch to the fabric; that is, to stretch the fabric in radially.

10 x-Q. 735. And the contact of the outside of the stitching-rollers with the skirts of the fabric would have some tendency to effect radial stretch?

A. At high speeds it would.

x-Q. 736. Did you mean to say that the radial stretch in your first commercial machine was about 15% at the bead?

A. Yes.

x-Q. 737. How did you determine that?

20 A. Well, it was done by measurement.

x-Q. 738. How did you measure it?

A. I don't know how that was done.

x-Q. 739. You testified that the first machine which you put on the floor at the end of your experiments was commercially satisfactory, but that it was afterwards improved by reducing the high speed. When was that reduction made, about?

A. Well, I don't know.

x-Q. 740. Was it in the year 1908?

30 A. I couldn't answer when it was made. I don't remember.

x-Q. 741. Was it before the year 1909?

A. I couldn't answer that.

x-Q. 742. You don't know at all when it was?

A. I couldn't tell you when it was.

x-Q. 743. Was that machine improved in any other respects, that you remember?

A. No, I don't remember.

40 x-Q. 744. You testified that one of the objections to

Will C. State for Plaintiff—Cross.

the very high speed in the machine was the effect of starting and stopping the core.

A. Yes.

x-Q. 745. Did you observe the operation of the machine carefully, so as to satisfy yourself on this point?

A. I have seen it operated, yes.

x-Q. 746. But you did not observe what the high speed was?

10

A. Did not.

x-Q. 747. Well, what was the purpose of your observation, why were you observing it?

A. Why, it would throw a core off.

x-Q. 748. No; I mean why were you looking at it? Weren't you looking at it for the purpose of remedying it?

A. Watching the machine work.

x-Q. 749. And see if you could improve it?

A. And see what happened with the speed. Slip the core around, then you would have to take it out of the core and adjust it again.

20

x-Q. 750. But you didn't know what the speed was?

A. No.

x-Q. 751. Not even approximately?

A. No.

x-Q. 752. Did you guess at it, looking at it with your eye?

A. No, I wouldn't guess at it.

30

x-Q. 753. What was the name of the draftsman to whom you referred as making the drawings of the first commercial machine?

A. Charley Wattleworth. He did a great deal of it. There was one other draftsman, Percy something; I have forgotten his name now; was in my office at that time.

x-Q. 754. Do you personally know whether or not any of the drawings of this first commercial machine were destroyed in 1913?

40

Will C. State for Plaintiff—Cross.

A. I couldn't answer that.

x-Q. 755. Who made the sketches you produced this morning?

A. Mr. Harsel.

x-Q. 756. What's his first name?

A. William; William Harsel.

x-Q. 757. He is a draftsman in the employ of the Good-10 year Company?

A. Yes.

x-Q. 758. And when did he make them, about?

A. Oh! the last week he has been making them.

x-Q. 759. Do you know what material he used in making them, from what he made them?

A. O, I made some pencil sketches on sheet of paper, about the outline, about the design; and he would work it up.

20 x-Q. 760. Is that all he had from which to make them?

A. That and the description of the experiment.

x-Q. 761. A written description?

A. No; just talked to him.

x-Q. 762. Did you give him any of the original drawings, or prints of them?

A. None whatever.

x-Q. 763. And you yourself remembered all the details of these sketches you produced?

A. Yes.

30 x-Q. 764. After the lapse of 12 or 13 years?

A. Yes.

x-Q. 765. Are you sure that the details of these sketches are correct?

A. As I remember them, they are correct.

x-Q. 766. Your memory is quite clear on it?

A. There on those sketches.

x-Q. 767. But you can't remember what the high speed of the first commercial machine was?

40 A. No, sir, I cannot.

Will C. State for Plaintiff—Cross.

x-Q. 768. There is no reason why you could not have seen the machine in evidence as Plaintiff's Exhibit No. 2 since the hearing at Cincinnati, if you had wished to do so, is there?

A. No reason; not that I know of.

x-Q. 769. Are you willing to let met see the few remaining drawings of the original drawings of the first commercial machine?

Mr. Rogers: Plaintiff's counsel inquires the purpose of counsel's request? Is it that he wishes to put them in evidence, or merely to inspect them?

Mr. Seward: I submit I don't have to answer that question, or decide my purpose, until I have seen them.

The witness: Yes.

20

x-Q. 770. Will you do so?

A. Yes.

Whereupon counsel for the plaintiff produced such drawings.

Mr. Seward: I offer in evidence the tracings just handed me by plaintiff's counsel, being Nos. 240M, 244M, 243M, 297M, 242M (B), 242M (D), 242M (C), 30309M, 238M, 310M, 242M (A), 242M (E), and 308M, with the request that the said prints be attached and marked as one exhibit, Defendant's Exhibit X. I am perfectly willing that prints of these tracings may be substituted for the originals as the exhibits, so that the originals may be retained in the custody of plaintiff or his counsel.

Cross-examination closed.

40

Will C. State for Plaintiff—Redirect.

REDIRECT-EXAMINATION BY MR. ROGERS:

Rd-Q. 771. I understand that Mr. Wattleworth's full name is Charles Wattleworth; is that correct?

A. Yes, sir.

Rd-Q. 772. And he was the draftsman that collaborated
10 with you, under your direction, and made many of the tracings that have just been introduced in evidence by defendant's counsel?

A. He was.

Rd-Q. 773. Did Mr. Wattleworth, in connection with your experimental work, operate under your direction?

A. He did.

Rd-Q. 774. Was his general mode of operation to work
out suggestions made to him by you?

20 A. They were.

Rd-Q. 775. For instance, and purely by way of example, in connection with the screws that you used to advance the slide, did you suggest the use of a screw to him, and leave it to him to work out the proper form?

A. I did.

Rd-Q. 776. I suppose that, as already referred to by defendant's counsel, it is rather a difficult matter to remember exact dates and exact utterances to those who were associated with you, after a lapse of 12 or 13 years; is that
30 correct?

A. Yes.

Rd-Q. 777. But, at any rate, you are sure that all of these experiments that have been testified to by you, and illustrated in your sketches were conducted and made prior to the time of the construction of the first commercial machine; is that correct?

A. They were.

Rd-Q. 778. And that first commercial machine, as in-
40 dicated in part by the drawings that have just been intro-

Will C. State for Plaintiff—Recross.

duced in evidence, was constructed in the winter of 1907 and 1908; is that correct?

A. Yes.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. SEWARD:

Rx-Q. 779. During the years 1907 and 1908 both you¹⁰ and Mr. Wattleworth were employees of The Goodyear Tire & Rubber Company, were you not?

A. Yes.

Rx-Q. 780. And all these experiments, and the manufacture of the first commercial machine in 1907, or early 1908, were made at the expense of the Goodyear Tire & Rubber Company, were they not?

A. I don't know what the expense went to.

Rx-Q. 781. You don't know who paid the expense?²⁰

A. I do not, absolutely. It was simply—you make an order through; it was given a number, see? and it just went right through by number.

Rx-Q. 782. Who made the orders?

A. They were made in the Order Department.

Rx-Q. 783. Of the Goodyear Tire & Rubber Company?

A. Yes.

Rx-Q. 784. Did Mr. F. A. Seiberling oversee this experimental work?³⁰

A. No, he did not.

Rx-Q. 785. Did he, to your knowledge, attend many of the experiments?

A. No, he did not.

Rx-Q. 786. Did he attend any of them?

A. He saw some of it.

Rx-Q. 787. Did he make any suggestions for the experiments?

A. I don't remember of any suggestions.⁴⁰

Frank A. Seiberling for Plaintiff—Direct.

Rx-Q. 788. Did he make any suggestions with regard to the manufacture of the first commercial machine?

A. Only we were permitted to go ahead with them.

Rx-Q. 789. But he didn't make any suggestions as to the detail of the construction?

A. No, he did not.

Rx-Q. 790. Or the general arrangement?

A. No, he did not.

10 Recross-examination closed.

Deposition closed.

Signature waived.

Adjourned until the following day at two o'clock P. M.

Resumed, pursuant to adjournment, July 8, 1920, at two o'clock P. M.

20 Present: counsel as before.

Whereupon FRANK A. SEIBERLING, the plaintiff herein, took the witness-stand in his own behalf; and, being first duly sworn, in answer to interrogatories propounded to him by Mr. Rogers, he deposes and says as follows:

Q. 1. Mr. Seiberling, you are the plaintiff in this suit?

A. I am.

30 Q. 2. And the President of The Goodyear Tire & Rubber Company?

A. Yes, sir.

Q. 3. How long have you been connected with that company?

A. Since its foundation in 1898.

Q. 4. Do you remember about when it was that you began to manufacture automobile tires of the kind here in controversy?

A. About 1903.

40 Q. 5. How were those tires made originally?

Frank A. Seiberling for Plaintiff—Direct.

A. Originally were made by hand.

Q. 6. Will you state briefly what operation was performed?

A. Tire was made on a core that had been rubberized with a cement; a ply was stuck on, the core revolved in stages, and the ply stretched on by hand until it overlapped at the point of beginning.

Q. 7. This first step that you have described is the so-called "circumferential stretch", is it not? ¹⁰

A. Yes.

Q. 8. Can you state generally what the amount of that circumferential stretch was?

A. Well, it was approximately 10 or 12 per cent., or thereabouts.

Q. 9. Now, after the ply was stretched upon the core in the manner stated by you, how were the unattached skirts worked down on the core? ²⁰

A. They were pulled down and stitched down with a little paddle, stitched with a hand-roller and finished.

Q. 10. What was the general character of the tool that the hand operator employed for this purpose?

A. He had a little paddle that he would use pushing down radially, with the idea of taking the flutings or wrinkles out.

Q. 11. In substantially the path shown in Plaintiff's Exhibit No. 7? ³⁰

A. Yes.

Q. 12. Have you any idea of the amount of radial stretch that was thus imparted to the skirts of the ply in attaching it to the core?

A. It would be about the same or a little more than the circumferential stretch. Would be a little more than the circumferential stretch.

Q. 13. You know Will C. State, do you not?

A. Yes, sir.

Frank A. Seiberling for Plaintiff—Direct.

Q. 14. Who was it that worked upon your first commercial machine?

A. W. C. State.

Q. 15. The same Mr. State who testified in this cause yesterday?

A. Yes, sir.

10 Q. 16. And is he the applicant upon whose application the patent in suit was granted?

A. Yes.

Q. 17. Do you remember when it was that State began his experiments on this machine?

A. In the year 1907.

Q. 18. Do you know what time of the year?

A. Well, it was the early summer of 1907. I will say in the summer of 1907; early summer of 1907.

20 Q. 19. Were you present in Akron at the time?

A. No, sir.

Q. 20. Where were you?

A. In Europe.

Q. 21. And when did you get back?

A. September, 1907.

Q. 22. Have you any means for assisting your recollection in this respect as to the fact that you were in Europe in the summer of 1907?

30 A. Why, I know that absolutely, if that's what you mean.

Q. 23. I direct your attention to a letter; and ask you to tell me, if you can, what it is.

A. It is a letter that I wrote from Milan, Italy, to my brother, August 12, 1907.

Q. 24. Without going into extreme detail, will you tell me the general purport of that letter?

40 A. I had learned of a machine used by Pirelli & Company, in Milan, known as the "Vincent" machine; and I had a talk with Pirelli about it; and I wrote my brother

Frank A. Seiberling for Plaintiff—Direct.

concerning it, and stated that I thought of negotiating with Vincent for United States rights.

Q. 25. Did your brother make any reply to the letter?

A. He cabled me not to make any arrangement with him, that State had gotten up a machine that had excellent promise.

Q. 26. You happen to have that cablegram?

A. No, sir; not at this time; not at this time.

Q. 27. You, however, recollect the cablegram?

A. I recollect it. I got the cablegram in Paris when I got back there.

Q. 28. When did you say you returned to this country?

A. About the middle of September, 1907.

Q. 29. Do you recall whether or not you went in to look at what State was doing in connection with this projected machine?

A. I don't recall just the particular time. I saw²⁰ the machine immediately upon my return, but the particular day I can't name.

Q. 30. You do remember, however, that you went in to look at it?

A. O, yes! I did that. Was very much interested in it.

Q. 31. When was it, Mr. Seiberling, that the machine was completed, if you recall, and put into commercial operation?

30

A. My recollection is, that the machine was being operated experimentally in the fall of 1907, and put into the factory, on the floor, in the winter or spring of 1908; I would say shortly after January, 1908.

Q. 32. Are you able to state whether or not your records show when that job was completed?

A. Our factory ledger shows that the first tire-building machine, No. 261, was completed, and the order on which it was built was closed out, date April 30, 1908.

40

Frank A. Seiberling for Plaintiff—Direct.

Q. 33. I hand you another letter; and ask you to state, if you can, what it is.

A. Letter dated May 1, 1908, addressed to my brother, Charles W. Seiberling, Sandy Hook, New York, written by me.

10 Q. 34. Will you kindly state whether or not that letter refers to the commercial machine?

A. It does.

Q. 35. Will you kindly read the passage therefrom that relates to it?

A. "We are making close to 300 motor tires a day, the machine having turned out 60 with two men in 10 hours; and it looks as though we had the situation well in hand for the rest of the season."

20 Mr. Seward: I understand that letter is used to refresh his recollection only, and on that basis do not object to it.

Mr. Rogers: Yes.

Q. 36. What about the commercial success of this first machine?

A. It was a success from the start.

Q. 37. Was the quality of tires good that were made on it?

A. They were.

30 Q. 38. And was that machine subsequently duplicated by you?

A. It was.

Q. 39. Tell us, if you can, to what extent and who are the users of it.

A. Well, I made—I granted about approximately 50 licenses, and we made approximately 600 machines used by those licensees; and that type of machine has been in service from that time to this.

40 Q. 40. Are you able to state to what extent the Good-

Frank A. Seiberling for Plaintiff—Direct.

year output of fabric tires has been made upon machines of this type?

A. Substantially exclusively from 1908 up to the present time.

Q. 41. Can you give me any idea of the number of tires that have been made upon machines of this type by the Goodyear Company?

A. Approximately 20,000,000.

Q. 42. And how many tires have been made by your various licensees of this machine during the same period, approximately? ¹⁰

A. An additional 40,000,000.

Q. 43. In other words, some 60,000,000 of tires have been made upon machines of this State type; that correct?

A. Yes, sir.

Q. 44. Have you any objection to telling us the amounts of royalties that you receive from your licensees? ²⁰

A. No.

Q. 45. In the use of these machines?

A. No. They approximate \$2,200,000.

Q. 46. How about the general rate of royalty that is paid you, and on what it is based?

A. The royalty is, graded as to size, and amounts to a fraction of one per cent. on the selling cost of the article; I mean on the selling price to the consumer.

Q. 47. What arrangement, if any, have you made with 30 your licensees since the Court of Appeals for the Sixth Circuit handed down its opinion in the Firestone case, this being about December, 1918?

A. Commencing with approximately January 1, 1919, I have arranged with my licensees to pay one-half the royalties fixed in the contract, and the other half to be held in abeyance until there shall be a final determination respecting the validity of the patent.

Q. 48. Have you had any new licensees, or put out ⁴⁰

Frank A. Seiberling for Plaintiff—Direct.

any additional machines to licensees, since the period under discussion?

A. I have. I will say about a dozen.

Q. 49. Now, can you provide us with a list of the licensees who are using machines of this State type?

A. I can. I submit it herewith. The list of licensees is as follows:

	Licensees.	Address.
10	The Amazon Rubber Com- pany	Akron, Ohio.
	Batavia Rubber Company....	Batavia, N. Y.
	Beacon Tire Company, Inc....	Beacon, N. Y.
	Bowling Green Rubber Com- pany	Toledo, Ohio.
	The Brunswick-Balke-Collen- der Company	Chicago, Ill.
	The Dayton Rubber Company.	Dayton, Ohio.
29	Empire Rubber & Tire Corp..	Trenton, N. J.
	The Federal Rubber Com- pany	Cudahy, Wis.
	The Fisk Rubber Company..	Chicopee Falls, Mass.
	G. & J. Tire Company.....	Indianapolis, Ind.
	The General Tire & Rubber Company.....	Akron, Ohio.
	The G. T. & R. Company of Canada, Ltd.....	Toronto, Ontario, Canada.
	The Gordon Tire & Rubber Company	Canton, Ohio.
30	Geo. Grow Automobile Com- pany	Boston, Mass.
	The Hartford Rubber Com- pany	Hartford, Conn.
	The Henderson Tire & Rubber Company	Columbus, Ohio.
	Hewitt Rubber Company....	Buffalo, N. Y.
	Howe Rubber Company.....	New Brunswick, N. J.
	Ideal Tire & Rubber Com- pany	Cleveland, Ohio.
40		

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Iowa Cord Tire Company....	Des Moines, Iowa.	
Kokomo Rubber Company...	Kokomo, Ind.	
L. & M. Rubber Company....	Carrolton, Ohio.	
Long-Wear Rubber Company.	Elyria, Ohio.	
The Marion Tire & Rubber Company	Marion, Ohio.	
The Mason Tire & Rubber Company	Kent, Ohio.	
The Mid-Continent Tire Mfg. Company	Wichita, Kansas.	10
Morgan & Wright	Detroit, Mich.	
The McLean Tire & Rubber Company	East Liverpool, Ohio	
The McClaren Rubber Com- pany	Charlotte, N. C.	
The McNaul Tire Company..	Toledo, Ohio.	
National Rubber Company...	Pottstown, Penna.	
The New Castle Rubber Com- pany	New Castle, Penna.	20
The Owen Tire & Rubber Com- pany	Cleveland, Ohio.	
The Pharis Tire & Rubber Company	Newark, Ohio.	
The F. E. Partridge Rubber Company	Guelph, Ontario, Canada.	
The Portage Rubber Com- pany	Barberton, Ohio.	
Rubber Products Company..	Barberton, Ohio.	30
The Star Rubber Company..	Akron, Ohio.	
Stungo-Radium Rubber Com- pany	Washington, Penna.	
The Swinehart Tire & Rubber Company	Akron, Ohio.	
The Victor Rubber Company.	Springfield, Ohio.	
Washington Rubber Com- pany	Washington, Penna.	
Yale Tire & Rubber Company.	New Haven, Conn.	40

Frank A. Seiberling for Plaintiff—Direct.

In addition to this list, there are various foreign licensees who I included in my general statement that I had more than 50 licensees; the list above given comprises merely the American licensees.

10 Q. 50. You will recall the machine that was in evidence in the Firestone suit, which machine has been introduced in evidence in this suit as Plaintiff's Exhibit 2. Can you state what that machine was?

A. It was the first commercial machine to which I have referred.

Q. 51. You refer to the machine that you have already discussed as having been first operated in the early part of 1908?

A. Yes, sir.

20 Q. 52. Do you know whether or not that machine was in substantially the same condition as when first constructed and used?

A. It was.

Q. 53. How do you know that?

A. I know it from observation, and from the fact that I saw it almost daily while it was in operation in the factory; and it was taken from the plant to courtroom in Cleveland and set up and put in operation there in precisely the same shape as it was used in the plant.

30 Q. 54. Have you examined that machine carefully or closely during the last five years?

A. I have not.

Q. 55. But you did examine it about that time?

A. I did.

Q. 56. And your statement now that it is substantially the same machine was based upon your observation at that time?

A. Yes, sir, when it was exhibited in the courtroom in Cleveland.

40 Q. 57. Are you able to state how many tires were

Frank A. Seiberling for Plaintiff—Direct.

produced on that machine before it was removed from service five or six years ago?

A. Approximately 150,000.

Q. 58. Those tires were of good quality?

A. They were.

Q. 59. Are the tires produced on that machine, and on the corresponding State machines you have already mentioned, of substantially the same kind as were previously made in the Goodyear plant by hand? 10

A. Yes, sir.

Q. 60. What is the amount of circumferential stretch of those tires, if you remember?

A. Around 10 to 12 per cent.

Q. 61. Would the remaining figures also hold, that the radial stretch is somewhat greater than that?

A. Yes, sir.

Q. 62. These two kinds of tires, one made by the "saw-tooth" hand method, and the other on the State machine, 20 are the only tires that have ever been produced in any considerable quantity by the Goodyear Company; is that correct?

A. Yes, sir.

Q. 63. And in both of those classes of tires the amount of radial stretch is somewhat greater than, or approximately equal to, perhaps, the circumferential stretch?

A. Yes, sir.

Q. 64. Did you ever hear of any class of tire that used 30 a different system of stretch?

A. Tires by some other manufacturers were made on machines that had a very much larger circumferential stretch than ours had, and practically no radial stretch.

Q. 65. Can you name any such machine?

A. Machines that were used by The Hood Rubber Company were of that general character.

Q. 66. How about the Vincent machine?

A. And the Vincent was of that character.

Frank A. Seiberling for Plaintiff—Direct.

Q. 67. Referring to the Vincent machine, what vogue did it have in this country?

A. The Goodrich Company had one.

Q. 68. Do you know whether or not that machine is still being used by the Goodrich Company?

A. It is not.

10 Q. 69. Do you know what happened to it?

A. It was used one season for a short time, and then consigned to the scrap heap.

Q. 70. Do you know whether or not any of those Vincent machines are still in operation in this country?

A. None.

Q. 71. You say the tires made on the State machines are substantially the same as those made by the former hand method. Do you mean to imply that the quality is the same?

20 A. The qualities are higher, much better.

Q. 72. The quality of the machine-made tire is much better?

A. Machine-made tire is much better than the hand-made.

Q. 73. And in what particular respect, if any?

A. Principally on account of its uniformity.

Q. 74. State what was the practice in the Goodyear plant in using the spinning-rolls of the State machine to
30 form around the bead.

A. In the early days we used the rolls in going clear around the bead.

Q. 75. And how about later days?

A. Later we run it down to the bead, and had a separate process for going on the lower side of it.

Q. 76. In other words, in the earlier times the State rolls were used to go about the bead, and then in later times you used some other appliances?

40 A. Yes, sir.

Frank A. Seiberling for Plaintiff—Direct.

Q. 77. How many tires a day can you make on the State machine?

A. The capacity of the State machine was about six tires per hour for the average man, using a 4-inch tire.

Q. 78. That is to say, in a 10-hour day you would make 60 4-inch tires?

A. Yes. That was in the early days. That has been improved on since.

Q. 79. And how many tires a day could be made by an operator using the old hand method? 10

A. He would average about six tires a day.

Q. 80. In other words, roughly speaking,—

A. Made as many per hour on the machine as you could make in a 10-hour day with a man.

Q. 81. Or, putting it another way, the machine capacity is about ten times that of the hand capacity?

A. Exactly.

Q. 82. As I understand the situation, the earlier tires made by the Goodyear Company were chiefly clincher tires; is that correct? 20

A. That's right.

Q. 83. And later on you began to make more straight-side tires?

A. Yes, sir. We have always made more clinchers than straight-sides, but the proportion of straight-sides was growing relatively to clinchers as time ran.

Q. 84. Why was it the Goodyear Company has preferred the combined circumferential and radial stretch method to the single circumferential stretch method in the manufacture of tires? 30

A. Because the fabric when applied is under less tension, and it makes a stronger carcass.

Q. 85. State whether or not you have succeeded in getting a more uniform stretch by the combined stretch method than by the single circumferential stretch method.

Frank A. Seiberling for Plaintiff—Direct.

A. Well, more uniform as to the sheet of fabric.

Q. 86. Are you still using the State machine in practically its original condition in the Goodyear factory?

A. Yes, sir.

Q. 87. To the same extent as formerly?

A. No, sir.

10 Q. 88. In other words, you are using a different form of machine also?

A. We have perfected a new type that is a single-unit machine, permitting but one operator, instead of two, and taking less floor space than the State machine.

Q. 89. You mean by that that each machine is provided with a single head, do you not?

A. Yes.

20 Q. 90. Whereas, in the old type of State machine it was provided——

A. Arranged for two operators; two heads for two operators.

Q. 91. Now, is the general State combination preserved in these improved machines?

A. Yes, sir.

30 Q. 92. I refer more particularly to the advancing table, or slide; the arms mounted thereon, and which carry the stitching-rolls; means for imparting inward or lateral pressure to the arms, so as to force the rolls against the core; and means for advancing the slide inwardly toward the core, so as to cause the rolls to traverse the core, and the fabric thereon, radially. Are these various features all continued in your improved machines?

A. They are.

Q. 93. There are also high and low speed devices therein, and speed-changing mechanism?

A. There are.

40 Q. 94. Will you state, as briefly as you can, some of the improvements that have been embodied in this new ma-

Frank A. Seiberling for Plaintiff—Direct.

chine? For instance, what form of pressure is applied to the stitcher-arms?

A. Air pressure.

Q. 95. Instead of the springs on the early State machine?

A. Springs, yes, that we had before.

Q. 96. Are the means for releasing this pressure, at the 10 time—

A. Automatically.

Q. 97. That the roll has completed its traverse inwardly across the core surface?

A. Automatically.

Q. 98. And are there any automatic means in it for separating the rolls?

A. There are.

Q. 99. So as to enable them to be restored to their original or outward position? 20

A. The head of the machine is automatic throughout: carriage moved forward on its trip; automatically returns; and pressure is automatic; and releases automatically; and the machine is an independent unit for one operator.

Q. 100. How about the bead-setter; how is that operated?

A. That operates pneumatic pressure.

Q. 101. And how is the drive controlled? 30

A. The drive is controlled by electricity; by merely touching knobs, we get the speeds—touching buttons, we get the speeds.

Q. 102. Where was it that the experiments leading up to first State commercial machine were performed, if you recollect?

A. In Akron, Ohio, in the attic of our old Shipping Room Building.

Q. 103. Can you state what the records of your com- 40

Frank A. Seiberling for Plaintiff—Cross.

pany show as to the time of employment of one Cary D. Derry?

A. Our record shows that Cary D. Derry, residing at 376 East Voris Street, was employed by the Company April 13, 1908, as a tire-builder, and left August 5, 1908.

Direct-examination closed.

10

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 104. How do you figure the radial stretch obtained in the hand-making of tires? I mean, How do you know it was a little more than the 10 or 12 per cent. circumferential stretch?

A. By measurement.

x-Q. 105. Did you measure that yourself?

20 A. No; but I have been with them when they were experimenting and testing it, and that's my observation.

x-Q. 106. Have you carefully observed others measuring them?

A. Yes.

x-Q. 107. Did you see the result of the measurement?

A. Yes.

x-Q. 108. Then you know that to be a fact?

A. I do.

x-Q. 109. Does this same apply to the amount of radial stretch on the machine-made tires?

30

A. Yes.

x-Q. 110. You know that to be a fact?

A. Yes.

x-Q. 111. From observation?

A. Yes.

x-Q. 112. Will you state what time in the year 1907 you left for Europe?

A. About—

40 x-Q. 113. I am referring to the trip on which you mentioned you were in Italy.

Frank A. Seiberling for Plaintiff—Cross.

A. About June 11th.

x-Q. 114. So you were abroad between three and four months?

A. I was abroad 13 weeks.

x-Q. 115. Will you please write into the record, or have copied into the record, the letter that you wrote from Milan to your brother on August 12, 1907, to which you have referred?

10

Mr. Rogers: Counsel for the plaintiff objects to the question, for the reason, as clearly stated in the record, the letter was used simply for the purpose of refreshing the recollection of the witness, and was not introduced in evidence.

A. I have no objection to doing so.

x-Q. 116. Will you please do so?

Mr. Rogers: Counsel for plaintiff objects to the question, for the reason previously stated; and gives²⁰ notice that, at proper time, he reserves the right to move for the expunging of the entire testimony on cross-examination relating to this matter.

Mr. Seward: I also offer this letter in evidence, with the request that it be marked "Defendant's Exhibit Y."

Mr. Rogers: Same objection to the offer, and same notice.

Mr. Rogers: Plaintiff's counsel further objects³⁰ to the subject-matter of the letter as being mere hearsay related by the witness in a private letter.

A. Said letter reads as follows:

Heading of Palace Hotel, Milan, Italy.

"MILAN, le 8/12 1907

"MY DEAR BROTHER:—

"I have just come from a meeting with Mr. Perelli. They have one of the tire machines invented 40

Frank A. Seiberling for Plaintiff—Cross.

10 by a Frenchman which makes 4 tires per hour up to the cover. He claims it works perfectly putting the fabric on at uniform tension, the beads accurately located, with a saving in material. He was not permitted to show it to any one in the absence of an order from the inventor since he has no American patents. He says Goodrich have two of them and that the inventor was in America sometime ago

20 starting them. They were sold under a guaranty to make 4 tires per hour as perfect as a sample submitted. Price of one set of machines to be 6,000 with a royalty of 1% on selling price, and a minimum guaranty for a period of years,—Perelli is going to give me a letter to the inventor. Now I am inclined to negotiate for one machine with the right to require more as needed and figure that we can make 100 tires a day, in much less space than

30 we are now making 200, besides doing it better,—provided nothing has been developed in my absence that shows we can do substantially as well on our own line,—Perelli is averaging almost 5 tires per man per day and is making more than 90% of his product on the machine. Talk the matter over with Litchfield and Stadleman, and cable me Western Union Code what you think of it to Paris. Both Work and Marks have been here, and Perelli stayed a week at Works house about a year ago. They employ 3900 people largely on insulated wire; Tires being a small part of their business.

“As I have not heard a word from anyone for over a month I will cable you from Geneva if I do not find any letters there, being particularly interested in your financial situation.

“Sincerely,

FRANK.”

“All Well.”

Frank A. Seiberling for Plaintiff—Cross.

x-Q. 116. You have no copy, I understand, of the cabled reply to this last-named letter?

A. I have not.

x-Q. 117. Are you sure that that cable referred to the machine as State's machine?

A. Yes, sir.

x-Q. 118. Do you remember the wording of the cable substantially exactly?

19

A. Substantially this: "Stadelman and I advise no arrangement with Vincent. State has made excellent progress with his machine; promises well."

x-Q. 119. What was the high speed of the core on that machine you have referred to as the first commercial machine, that was completed April 30, 1908?

A. I don't know exactly. Around 200, I should say.

x-Q. 120. What was the low speed of the core?

A. O, around 15! About 15.

20

x-Q. 121. Do you mean to testify that the 50 licensees to which you have referred have used machines which were actual duplicates of that first machine?

A. No, sir.

x-Q. 122. And, when you refer to the 20,000,000 tires made by the Goodyear Company, and the 40,000,000 made by your licensees, you do not refer to the use of machines exactly like that first machine, do you?

A. I do not.

x-Q. 123. And the 40,000,000 tires to which you have referred are the ones from the manufacture of which you have received the royalties which you have stated as in the neighborhood of 2,200,000; is that correct?

A. Yes, sir.

x-Q. 124. Were those agreements with those 50 licensees in writing?

A. Yes, sir.

x-Q. 125. Were they all uniform prior to January 1, 1919?

40

Frank A. Seiberling for Plaintiff—Cross.

A. Yes, sir.

x-Q. 126. Exactly?

A. Yes, sir. Oh, no; pardon me! The license of the Fisk Company, the first one that I made, was slightly different in terms from the remainder.

x-Q. 127. What was the particular difference?

A. The only difference was as to the time when the
10 royalties were to apply to absorb the advance royalties on the machine.

x-Q. 128. Did the licenses—I mean these agreements with these 50 licensees—also grant a license under the Seiberling and Stevens patent No. 726,561, dated June 14, 1904?

A. They did.

x-Q. 129. And the royalties to which you have referred were paid for the license under these two patents?

A. Yes, sir.
20

x-Q. 130. The license agreements did not discriminate between the two patents as to the royalty payments, did they?

A. No, sir; except that the royalties were to continue, after the expiration of the Seiberling and Stevens patent, to the full amount, to the expiration of the State patent.

x-Q. 131. Now, the licenses that you have granted since January 1, 1919, were they written agreements?

A. Yes, sir.

x-Q. 132. Is the royalty rate exactly half of that provided in the former license agreements?
30

A. Yes, sir. No, the royalty rate is the same; I am merely holding half in abeyance. The rate is the same. I am holding up one-half of it until the validity of the patent is determined.

x-Q. 133. When you say you are holding up one-half of it, you mean each licensee withholds one-half?

A. Exactly. I am permitting them to withhold one-
40 half until the validity of the patent shall be determined.

Frank A. Seiberling for Plaintiff—Cross.

x-Q. 134. How is the question of the validity of the patent to be determined under these agreements?

A. By a final decision of the highest court of appeal.

x-Q. 135. You mean the United States Supreme Court?

A. The United States Supreme Court.

x-Q. 136. And, if the validity of the patent is not sustained, the licensees do not have to pay this half of the 10 royalty?

A. No, they do not.

x-Q. 137. Have the licensees, since January 1, 1919, been provided with machines embodying improvements over the first commercial machine?

A. Some of them have.

x-Q. 138. Have any of them been provided with machines just like the first commercial machine to which you have referred?

A. Four-fifths of the machines were of the type of the 20 first machine I have referred to.

x-Q. 139. Do you mean they were just like the first commercial machine?

A. Can't say that they were absolutely alike in every particular. They were made from the same patterns and were alike in their design and function.

x-Q. 140. How about the high speed of rotation of the core? Was that the same in these machines provided licensees since January, 1919, as in the first commercial 30 machines?

A. No, that was subsequently reduced.

x-Q. 141. That was reduction to a speed around 120 or 130 r.p.m. was it not?

A. I think it was about that.

x-Q. 142. And that reduction was made as far back as 1908, wasn't it?

A. No.

x-Q. 143. When was it made?

Frank A. Seiberling for Plaintiff—Cross.

A. Considerably after that. I can't tell you exactly when. We made gradual reductions in the speed of the core as we found it advantageous.

x-Q. 144. Do you remember when the high speed of the core was first reduced in the first commercial machine?

A. I do not.

10 x-Q. 145. Can you approximate the date?

A. I think the speed was reduced after we made our first machine to about 150.

x-Q. 146. That is, the speed in the second was made about 150?

A. That's my recollection.

x-Q. 147. And about when was that second machine built?

A. Well, we commenced getting them on the floor in 1909.

20 x-Q. 148. Didn't you have more than one commercial machine on the floor in 1908?

A. I can't tell you about that. I can ascertain it, but I can't tell you now.

x-Q. 149. Your recollection is not at all clear on that?

A. Well, my recollection is, that we commenced getting additional machines on the floor early in 1909.

x-Q. 150. That would be how early in 1909 about?

A. Well, very early in 1909.

30 x-Q. 151. January, probably?

A. Yes, very early in 1909.

x-Q. 152. And do you remember when the high speed of the core was first reduced to about 150?

A. I do not.

x-Q. 153. Can you approximate the date?

A. I should say three years ago.

x-Q. 154. That is, since the trial of the case against Firestone Company?

40 A. Yes.

Frank A. Seiberling for Plaintiff—Cross.

x-Q. 155. Have some of the machines that have been provided the licensees recently,—that is, since January, 1919,—embodied one or more improvements shown in one or more patents other than the State patent in suit, and owned wholly or in part by you, or under your control?

A. I don't know at the present time; but I will look it up and advise Mr. Rogers, and he will advise you of my answer. 10

x-Q. 156. Is The Howe Rubber Company, of New Brunswick, New Jersey, one of your licensees now?

A. Yes, sir.

x-Q. 157. Are you sure of that?

A. I executed a license to them.

x-Q. 158. Did they accept this modified form of license that you have referred to as being in force since January 1, 1919?

A. I can't say as to that definitely, but I will ascertain 20 and let you know.

x-Q. 159. Have you any doubt about any of the other licensees listed here?

A. I haven't any licensee who has, to my knowledge, refused to accept the modification.

x-Q. 160. Does your knowledge extend to the fact whether or not all of them have?

A. I would have to check that to give you exact information on it; which I will do, and advise you through 30 Mr. Rogers before the close of the rebuttal testimony.

x-Q. 161. And will you please indicate which of these licensees had a license before January, 1919, and which are the new licensees that you have referred to?

A. I will.

x-Q. 162. And provide me the information for the record in the same way?

A. I will.

x-Q. 163. Several of these licensees are owned or con- 40

Frank A. Seiberling for Plaintiff—Cross.

trolled by a single corporation, The United States Tire Company, or The United States Rubber Company, are they not?

A. Yes, sir.

x-Q. 164. Will you please name those?

A. The G. & J., Morgan & Wright, and The Hartford Rubber Works Company.

10 x-Q. 165. Have all the licenses of this new form which you have brought out since January, 1919, been uniform?

A. Yes, sir.

x-Q. 166. That is, their terms are the same?

A. Yes, sir.

x-Q. 167. Do you remember what was the low speed of core rotation of the first commercial machine at the Goodyear plant to which you referred?

A. I think it was approximately 15.

20 x-Q. 168. I believe you have testified that that machine, Exhibit No. 2 as put in evidence, is in substantially the same condition as it was originally used?

A. I have.

x-Q. 169. Do you mean as it was originally used in the attic to which you have referred, or as originally used on the floor?

A. Used on the floor.

x-Q. 170. After it was removed from the attic?

A. Yes.

30 x-Q. 171. Do you know what the high and low core speeds are for that machine, Exhibit 2? I mean, Do you know that they are the same as the speeds which you have given for the first commercial machine?

A. You are referring to that particular machine, are you?

x-Q. 172. I am referring to the particular machine in evidence.

A. You are asking me for absolute knowledge, and I
40 haven't got it. And I haven't.

Frank A. Seiberling for Plaintiff—Cross.

x-Q. 173. Isn't it a fact that some changes were made in that machine before it was put in evidence in Cleveland, in order to return it to its original condition?

A. That is a fact.

x-Q. 174. Do you mean to state that it is literally a fact that you saw that machine almost daily in operation from 1908 down to the time it was put in evidence in Cleveland?

A. Yes, sir.

16

x-Q. 175. Weren't you away from the factory months at a time?

A. Yes. Not months at a time, no. Yes; that is, I was away one period for five weeks in the interim.

x-Q. 176. How many times were you abroad in the interim?

A. Once.

x-Q. 177. Is that the period to which you referred?

A. Yes, sir.

20

x-Q. 178. How do you figure the answer which you have given, that about 150,000 tires were made on that machine?

A. I looked up the record at the time I testified in the case before Judge Kilitts, and found that the machine had made over 150,000 tires.

x-Q. 179. Did you ever see the Vincent machine in the plant of the Goodrich Company?

A. I did not.

30

x-Q. 180. Do you mean to testify of your own knowledge that it was only used part of one year and then thrown in the scrap heap?

A. No, sir.

x-Q. 181. When you say that the stitching-rollers of the first commercial machine were used for turning the fabric clear around the bead, do you mean that they actually tucked the fabric all the way into the tongue of the core along the bottom of the bead?

40

Frank A. Seiberling for Plaintiff—Cross.

A. Yes, sir.

x-Q. 182. So that no hand operation was required whatever?

A. No, sir, no hand operation was required.

x-Q. 183. Were the spinning-rolls in that machine set at a receding angle to the plane of the core?

A. They were.

10 x-Q. 184. And that angle was acute toward the outer periphery of the core?

A. Yes, sir. The operator, by a slight pressure on the handlebars at the moment of rolls reaching the top of the bead, enabled the carriage to move on around to the bottom of the bead, rolls turning in the fabric all the while.

x-Q. 185. Did the rolls operate at that time with their edges or with their sides?

A. With their edges and sides.

20 x-Q. 186. Why did you stop operating the machines in that way at the Goodyear plant?

A. Because the construction of that time did not make as good a job as we could get by a separate tool.

x-Q. 187. You have referred to a new type of machine that, you say, has been perfected at the Goodyear plant, and have mentioned some of the improvements. Does one of those improvements which you have not mentioned consist in an arrangement for changing the angle of the spinning or stitching rollers with respect to the plane of the
30 core?

A. It does.

x-Q. 188. Are there any other improvements that you can remember besides those mentioned?

A. I have given you the essential improvements, the most important improvements.

x-Q. 189. You don't remember any others just now?

A. No, I do not.

x-Q. 190. Will you tell me about what the high speed
40 of the core is in these new machines?

Frank A. Seiberling for Plaintiff—Cross.

A. About 125.

x-Q. 191. And about what's the low speed?

A. About 12.

x-Q. 192. Will you state whether or not the Goodyear Company has, by contract with you, a fixed interest in the royalties which you have referred to as being received under your license arrangements?

A. They have.

10

x-Q. 193. How long has that been a fact, about?

A. From the beginning.

x-Q. 194. That is, from the year 1908 or 1909?

A. Yes, sir.

x-Q. 195. Can you say whether the experiments which you have referred to as being conducted in the attic were at the expense of the Goodyear Company?

A. They were.

x-Q. 196. The Goodyear Company has never paid you 20 any royalty under license, has it?

A. They have not.

x-Q. 197. Have you been the sole licensor in all the license agreements to which you have referred?

A. I have.

x-Q. 198. Are you willing to produce and let me see a copy of the form of license agreement that you have been using since January, 1919?

A. I am.

x-Q. 199. Are you willing that I should put one in evidence, if I should see fit, after examining it?

A. I am.

x-Q. 200. Will you ask Mr. Rogers to let me see a copy at the same time that he provides me with the other information already referred to?

A. I will.

Cross-examination closed.

Frank A. Seiberling for Plaintiff—Redirect.

REDIRECT-EXAMINATION BY MR. ROGERS:

Rd-Q. 201. You have stated that some of the machines that have been provided to your licensees have contained various improvements on the original form of State machine. I should like to have you state whether or not any of these machines furnished your licensees do not contain the following elements: a high-speed core; a slide, and means for advancing it; stitcher-arms, and stitchers
10 mounted on the slide; and pressure devices for forcing the stitchers against the side of the core.

A. All of them contain the features named.

Rd-Q. 202. Do all of them also contain a high and low speed mechanism for the core, and speed-change mechanism?

A. They do.

Rd-Q. 203. You have displayed some lack of memory as to certain features and incidents occurring in 1907, 1908, and 1909. In this connection you have stated that possibly the speed of the core in the machines put on the floor
20 in 1909 was about 150. Do you mean to state definitely that this lowered speed was obtained as early as 1909?

A. I do not.

Mr. Rogers: Plaintiff's counsel, without waiver of objection previously noted, will now examine the witness as to the disputed letter of August 12, 1907.

Rd-Q. 204. Mr. Seiberling, at the time you wrote the letter of August 12, 1907, had you seen a Vincent
30 machine?

A. I had not.

Rd-Q. 205. Then the statements that were made in that letter concerning the utility and value of the Vincent machine were based entirely on hearsay?

A. Entirely on information that I had received from Mr. Pirelli, who stated that he was part owner in the patent.

40 Mr. Rogers: Counsel for plaintiff states that, for the reasons stated in the last two answers of the

Frank A. Seiberling for Plaintiff—Recross.

witness, he further objects to the consideration of the letter, or its introduction in evidence; and shall also advance the ground of hearsay in connection with his motion to strike out the evidence and the exhibit.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. SEWARD.

10

Rx-Q. 206. At the time you wrote that letter of August 12, 1907, were you President of The Goodyear Tire & Rubber Company?

A. I will have to answer that by saying my recollection is, I was first elected President in 1908.

Rx-Q. 207. And at that date of August 12, 1907, were you an officer of the Goodyear Company?

A. I was a director and General Manager.

Rx-Q. 208. What position did your brother to whom you wrote that letter hold?

A. He was Secretary.

Rx-Q. 209. Of the Goodyear Company?

A. Yes, sir.

Rx-Q. 210. Mr. Litchfield whom you mentioned in that letter was an officer of the Goodyear Company; or, if not, what position did he hold?

A. He was Superintendent of the factory.

Rx-Q. 211. And Mr. Stadelman whom you mentioned—

30

A. Was Sales Manager.

Rx-Q. 212. Of the Goodyear Company?

A. Yes, sir.

Rx-Q. 213. The gentlemen Work and Marks whom you mentioned in the letter were connected with The B. F. Goodrich Company, were they not?

A. No; Marks was Factory Manager of The Diamond Rubber Company, and Work was President of the Goodrich Company.

40

Frank A. Seiberling for Plaintiff—Re-redirect.

Arthur R. Mackey for Plaintiff—Direct.

Rx-Q. 214. And when you mentioned in this letter negotiating for one machine, you referred to the Goodyear Company negotiating, did you not?

A. Yes, sir.

Rx-Q. 215. Were you here at any time yesterday during the taking of Mr. State's testimony?

A. No, sir.

Recross-examination closed.

10

RE-REDIRECT-EXAMINATION BY MR. ROGERS:

R-rd-Q. 216. Is Will C. State now employed by the Goodyear Company and who conducted the experiments for the first Goodyear commercial machine the same Will C. State who assigned his application for a patent, which patent issued to you and is the patent in suit?

A. He is the same one.

20 R-rd-Q. 217. Is there more than one Will C. State connected with the Goodyear Company?

A. There is not.

Re-redirect examination closed.

Deposition closed.

Signature waived.

Adjourned until 11 o'clock A. M. of the following day.

30 Resumed, pursuant to adjournment, at 11 o'clock A. M. of July 9, 1920.

Present: counsel as before.

Whereupon ARTHUR R. MACKEY, the next witness called on behalf of the plaintiff, being first duly sworn, in answer to interrogatories propounded to him by Mr. Rogers deposes and says as follows:

Q. 1. Please state your name and residence.

40 A. Arthur R. Mackey; 892 Johnston Street, Akron, Ohio.

Arthur R. Mackey for Plaintiff—Direct.

Q. 2. What is your present occupation, Mr. Mackey?

A. General contractor.

Q. 3. And how long have you been engaged in that line of business?

A. 10 years.

Q. 4. Were you ever in the employ of the Goodrich or Diamond tire companies?

A. Yes, both of them.

10

Q. 5. Can you state about when that was?

A. I was at the Goodrich two different periods. In 1906 or 1907. It was at the time of the 1907 panic I was laid off for a few months; and was sent for, and went back again at the Goodrich; worked there for a few months more, and left there on account of all night work and went to the Diamond.

Q. 6. And when was it you went to the Diamond, what year about?

A. It was about 1908 or nine; between 1907 and nine,
as near as——

20

Q. 7. What was your position at the Diamond, Mr. Mackey?

A. When I first went there, I was a tire-builder; and afterwards an inspector of tire construction.

Q. 8. I suppose you have both made tires yourself and seen many of them made at the Diamond plant?

A. Yes, sir.

Q. 9. What was the official and authorized way of
making tires at the Diamond plant by hand?

A. Why, by pulling on the plies as near as straight as possible upon the core, with about as much strength as a person had to pull them on with. Sometimes you had to pull them more than once. And stitching them down with a fine stitcher by hand.

Q. 10. What do you mean by "stitching them down"? How was the operator supposed to work the tool in stitching them down?

40

Arthur R. Mackey for Plaintiff—Direct.

A. Why, you held your ply over your fingers with the left hand and stitched down with the right hand in a diagonal way across the ply, from the side of the core down toward the bead.

Q. 11. Do you mean somewhat in the manner indicated in Plaintiff's Exhibit No. 7?

A. Yes, sir.

10 Q. 12. You understand what I mean when I call that, for purposes of convenience, the "sawtooth" method?

A. Yes, sir.

Q. 13. You say that the sawtooth method was the official or recognized method at the Diamond plant. Was there any other unofficial method employed there for forming the sides of the ply to the core?

A. There was.

Q. 14. What was that?

20 A. We first stretched the ply of fabric on the core, and then spun the core as rapidly as we could by hand, and then rolled the fabric down on the side of the core by a stitcher held in the hand of the operator, moving the hand inwardly down toward the bead. When the plies were stretched on tight and even, we could spin down to the bead, and sometimes out to the heel of the bead.

30 Q. 15. You say this was an unofficial method employed in the Diamond plant. Do you mean that this hand-spinning method you have last described was not officially prescribed in the Diamond plant?

A. It was not the method taught to be practised in the Diamond at that time.

Q. 16. What was the method that was taught to be practised there?

A. The method heretofore spoken of as the "sawtooth" method.

Q. 17. Have you yourself made tires in the Diamond plant by this unofficial handspinning method?

40 A. Yes, sir.

Arthur R. Mackey for Plaintiff—Direct.

Q. 18. Under what circumstances did you make them? Did you do it in the presence of those in authority over you?

A. Well, it wasn't done in their presence.

Q. 19. Do you remember the conference I had with you a few weeks ago?

A. Yes, sir.

Q. 20. What did I ask you to do at that time? 10

A. Well, first you asked me if I could make tires as I had done during those days of tire construction; and I said that I could. And you also asked me if I would, and I said I would. Then a date was set; and I met at the Goodyear; and they conducted me to the Experimental Department, and gave me cores and plies; and they asked me to make tires by this handspinning method, as near as I could, as I had done before.

Q. 21. And how many of those tires did you make in 20 that way, if you recall?

A. During the entire time?

Q. 22. Yes?

A. In the neighborhood of 20; between 20 and 25.

Q. 23. How were these tires marked which you made by the handspinning method in the Goodyear plant within the last 60 or 90 days?

A. They were marked with a red-paint numbering, "1" to "10," and with a letter initial "M" on each tire.

Q. 24. Now, when I asked you to make these tires by 30 the hand-spinning method at the Goodyear plant, what request or instructions did I give you?

A. Well, the words, as near as I can recall them, are, "Now, you are the boss; tell us what you want, and make them as near as you did at the Diamond years ago."

Q. 25. Did I tell you to make them of as good quality as you could?

A. Yes, sir, when we started. Then you stated, "Well, make them just as good as you can." 40

Arthur R. Mackey for Plaintiff—Cross.

Q. 26. You first made a few experimental tires, did you not, to determine whether or not your hand had its previous skill; that right?

A. Yes, sir.

Q. 27. And then, if I am correctly advised, you made a first set of 10 tires?

A. Yes, sir.

10 Q. 28. Do you recall any difficulty that occurred in connection with that first set of 10 tires?

A. Yes; through an error of the man that brought the fabric, he brought 4½-inch tire fabric to be used on a 4-inch core; which was much heavier than the 4-inch fabric; and they all buckled in the mold, pinched in the mold.

20 Q. 29. And then, if I am advised correctly, you started in and made a second set of 10 tires with different and more appropriate material? Is that correct?

A. Yes, sir.

Q. 30. And these were all made by the handspinning method, in substantially the way that you used to make them in the Diamond plant, and with as much skill and ability as you were able to exert upon them?

A. Yes, sir.

Direct-examination closed.

30 CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 31. When did you leave the Diamond plant?

A. It was during nineteen—let's see. It was about the year 1909.

x-Q. 32. Where did you go from there?

A. Went to contracting.

x-Q. 33. Been a contractor ever since?

A. Yes, sir.

x-Q. 34. What line of business?

40 A. General contractor.

Arthur R. Mackey for Plaintiff—Cross.

x-Q. 35. Have you specialized in any line?

A. Well, dwellings and brick.

x-Q. 35A. Building materials?

A. Buildings, yes, all buildings, construction.

x-Q. 36. That's been chiefly your line? Have you been engaged in any tire-manufacturing concern since 1909 until you made these experimental tires?

A. Yes, I worked a couple of months, I think, at the Firestone plant. 10

x-Q. 37. When was that?

A. Well, now, the exact date I can't tell you; but it was at the completion of their new building on Main Street, when they moved from Sweitzer Avenue to Main Street.

x-Q. 38. Was that soon after you left the Diamond?

A. O, that was in about a year!

x-Q. 39. What did you do at the Firestone? 20

A. Make tires.

x-Q. 40. Inspector or tire-builder?

A. Builder.

x-Q. 41. Now, from that time when you were at the Firestone until you built these tires at the Goodyear plant two or three months ago, had you made any tires?

A. I had not.

x-Q. 42. Why did you leave the Diamond plant?

A. Well, I left the Diamond plant because of a personal disagreement with the foreman. 30

x-Q. 43. And why did you go into contracting business after leaving the Diamond, instead of going to some other tire concern?

A. Well, after leaving the Diamond I went to work at carpenter work for a contractor; and he hadn't been very long at contracting, and was making considerable money; and during that same summer I bought a lot and started a house for myself; with the assistance of foreman for instructions, I soon built the house, and sold it, 40

Arthur R. Mackey for Plaintiff—Cross.

made several hundred dollars on it, and saw that it was a good game; so I went right at it and contracted ever since.

x-Q. 44. Why did you go to the Firestone for the two months?

10 A. It was about Christmas time, and the weather was very bad, we couldn't work out. It was a very heavy snow, a heavy winter. And I worked there until the 1st of March, because it was inside.

x-Q. 45. Did you leave Firestone of your own accord?

A. I gave them notice, and left there to start building that I had under way.

x-Q. 46. And you held no other position than that of a tire-builder while you were at the Firestone?

A. I did not.

x-Q. 47. What size tires were these that you recently made at the Goodyear plant?

20 A. 34 by 4.

x-Q. 48. All the same size?

A. All the same size.

x-Q. 49. Clincher or straight-side?

A. Straight-side.

x-Q. 50. With the wire bead?

A. Well, the beads were wrapped; I didn't see what they were.

x-Q. 51. Inextensible bead?

30 A. Yes.

x-Q. 52. Who was with you while you made those tires?

A. A man by the name of Albert Shaw and a man by the name of Mr. Ray.

x-Q. 53. Anybody else?

A. No.

x-Q. 54. Were those men present while you made all the tires?

40 A. Practically so.

Arthur R. Mackey for Plaintiff—Cross.

x-Q. 55. And no one else was present while you made any of the tires?

A. Why, Mr. Trogner of the Goodyear came over from his office and watched—seen two or three of them made. Mr. Rogers was there at the starting of the tires to witness my skill, but not at the time of the 10 tires that were made for official exhibit.

x-Q. 56. Mr. Rogers was there while you were making one or two of the first tires? 10

A. First one or two tires.

x-Q. 57. Now, can you recall anybody else who was there while you were making any of the tires, any of the 20 or 25?

A. Why, there was other men working about the room; but, then, there was none of them that came and made it their business to—

x-Q. 58. Did any of them stand and observe you, or make suggestions to you, or talk with you about the making of any of those tires? 20

A. No. There was one man there that talked to me several times during the construction of those tires, but not of the tires; it was other business.

x-Q. 59. Who brought you the fabric?

A. A man by the name of Al Shaw was the one that brought it to me.

x-Q. 60. Who brought you the beads?

A. Mr. Shaw.

x-Q. 61. Now, did you yourself put on all the plies of all of those tires? 30

A. I did.

x-Q. 62. You did all the stretching?

A. I did.

x-Q. 63. You did all the stitching?

A. I did.

x-Q. 64. You put the beads on?

A. All but a few. Mr. Shaw put on a few of them. 40

Arthur R. Mackey for Plaintiff—Cross.

x-Q. 65. About how many tires did Mr. Shaw put the beads on?

A. O, I presume Mr. Shaw put four or five beads on out of the last 10.

x-Q. 66. What kind of a device did you and Mr. Shaw use for putting the beads on?

10 A. They had a cast ring, or an iron ring, that was made to fit over the base of the core to place the bead the proper place.

x-Q. 67. You had one of these rings for each side of the tire, didn't you?

A. Yes, sir.

x-Q. 68. Were they held on by clamps?

A. No, they just—they were made to fit the bolt-ring of the core. They just set in——

x-Q. 69. By the "bolt-ring" you mean the ring that holds the sections of the collapsible core together?

20 A. Yes, sir.

x-Q. 70. By "collapsible core" you mean a core which is made in several pieces, instead of being a solid ring?

A. Yes, sir; held together with two rings bolted on each side.

x-Q. 71. Those rings being connected with the tongue of the core?

A. Yes, sir.

30 x-Q. 72. Were the rings which were used to place the beads left in position while you did any stitching?

A. They were not. Just a minute! You mean the stitching of plies?

x-Q. 73. Stitching of plies?

A. No.

x-Q. 74. Were they left in position while you rolled the beads?

A. Yes, sir.

40 x-Q. 75. What kind of a tool did you use for rolling the beads?

Arthur R. Mackey for Plaintiff—Cross.

A. Quarter-inch—a stitcher quarter-of-an-inch face.

x-Q. 76. With a groove in the face?

A. No.

x-Q. 77. A plain cylinder?

A. A plain stitcher; a stitcher of about an inch and a half, inch and three-quarters, in diameter, with a quarter-inch face.

x-Q. 78. A flat face?

A. Flat face.

10

x-Q. 79. Did you use any other tool for rolling the beads?

A. We used the—now, on those beads they had a sort of a flap strip that came up on to the plies a little ways, and we used a two-inch roller in rolling that down.

x-Q. 80. Was that flap strip folded from the tongue of the core outwardly?

A. No; it was from the top of the bead up on to the ply possibly an inch.

20

x-Q. 81. Towards the periphery of the core?

A. Towards the tread of the core.

x-Q. 82. That was the two-inch cylindrical roller that you used for rolling that flap strip down?

A. Yes.

x-Q. 83. Now, what kind of a stitcher did you use for spinning down the fabric?

A. Well, we used the two-inch roller from the center of the tread to possibly half way between the tread and the bead, and then I used a stitcher with about $2\frac{1}{2}$ inches in diameter and a thirty-second-inch face there down to the bead.

x-Q. 84. What did you use for putting the fabric around the bead?

A. I didn't do that.

x-Q. 85. Then you stretched down and spun down the plies which went under the bead, you put on the beads (except for those that Mr. Shaw put on), and you

40

Arthur R. Mackey for Plaintiff—Cross.

stretched down and spun down the remaining plies of fabric, except that you did not spin them or roll them over the beads; is that correct?

A. That's correct.

x-Q. 86. Was that finishing over the beads done in your presence?

A. It was done by a man on an adjoining machine,
10 but I didn't watch him.

x-Q. 87. What do you mean by "an adjoining machine"?

A. Why, these were made on a stand or machine; and it's two arms projecting from it; and he finished them on the arm on the opposite side, and part of them on a similar machine alongside.

x-Q. 88. When you said "machine," you meant a making-up stand?

A. Yes, making-up stand.
20

x-Q. 89. Did you put the cushion-rubber on any of those tires?

A. I did not.

x-Q. 90. Did you put the breaker-strip on any?

A. I did not.

x-Q. 91. Did you put the side-wall rubber on any?

A. I did not.

x-Q. 92. Did you put the tread on any?

A. I did not.

x-Q. 93. Did you put any of them in the molds?
30

A. I did not.

x-Q. 94. Did you see them put in the molds?

A. I did not.

x-Q. 95. Did you see any of the rubber put on?

A. Why, I seen the man putting on the side walls and treads.

x-Q. 96. Was that done in the same room?

A. That was done at the same—by the same man that
40 worked the plies over the bead.

Arthur R. Mackey for Plaintiff—Cross.

x-Q. 97. Did you watch him carefully when he put on the rubber?

A. Oh, no! I just noticed he was doing it, that was all.

x-Q. 98. Do you know how long those tires were cured?

A. I do not.

x-Q. 99. And what steam-pressure or temperature?

A. I do not.

x-Q. 100. Did you do all the stretching of the fabric¹⁰ by yourself?

A. I did. I done all the stretching by myself. To start the first ply, some one had to hold the end or it would have slipped off of the core. That was all. Somebody held the end each time for the first ply only.

x-Q. 101. Was the core cemented?

A. Core was cemented.

x-Q. 102. Who was it held the end?

A. O, different—sometimes it was Mr. Ray, and some-²⁰ times it was Mr. Shaw; and then, if there wasn't some one right there at the second to put their hand on, I pulled the ply on, and reversed the ply afterwards and stretched that end that hadn't got stretched.

x-Q. 103. Then the first ply was not put on in the form of a continuous band? I mean it was not made in band form before it was put on?

A. It was not.

x-Q. 104. Was the core cemented?

30

A. It was.

x-Q. 105. How long were you an inspector at the Diamond Company before you left?

A. Exact length of time I could not tell you. It was several weeks.

x-Q. 106. What kind of tires did you make at the Diamond Company,—you yourself?

A. Myself? I made the rubber-bead clincher tire; and I made the linen-bead q. d.; and I made the wire-bead,⁴⁰

Arthur R. Mackey for Plaintiff—Cross.

what we called at that time "mechanical," which is called to-day the "straight-side;" and I also made Fisk tires.

x-Q. 107. Now, on which of those did you use the hand-spinning, where you spun the core?

A. On the clinchers, q. d., and straight-sides.

x-Q. 108. The Fisk tire you referred to is that one with the big peculiar-shaped bead?

10 A. Yes, with bolts through it.

x-Q. 109. What size tires did you make at the Diamond Company?

A. From 28 by 3 to 5 inch or 5½; we made a few fives and a half at that time.

x-Q. 110. You made those yourself?

A. Made those myself.

x-Q. 111. What were the names of the foreman and superintendent who were over you at the Diamond Com-
20 pany?

A. Wheeler was the foreman; I don't remember his first name; and Mike Flynn was the superintendent.

x-Q. 112. You have spoken of a fine stitcher being used by you at the Diamond Company. What did you mean by "fine"?

A. Why, a stitcher that I afterwards described as about 2½ inches in diameter and the thirty-second-inch face.

x-Q. 113. When you said "fine" you referred to the
30 thin edge?

A. Thin edge, yes, sir. That's the way—in mentioning the stitcher, that's the way we always mentioned it, —a "fine" stitcher.

x-Q. 114. Was there any difference between the stitcher you used at the Diamond Company and the stitcher you used in these tires you recently made in the Goodyear Company?

A. When I worked at the Diamond, I had two stitch-
40 ers. The one stitcher was about an inch and a half, with

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a thirty-second face; and the other one was about $2\frac{1}{2}$ or $2\frac{3}{4}$, with a thirty-second face; and the larger-size stitcher was practically identical with the stitcher that I used at the Goodyear a few weeks ago.

x-Q. 115. For what did you use the stitcher of smaller diameter at the Diamond plant?

A. The stitcher of smaller diameter was the first small stitcher used in tire construction; and afterwards found that the hub of the stitcher would buckle into the plies too often, and larger stitcher was made. These larger stitchers we got at the hardware store, our own buy; we bought them ourselves. 10

x-Q. 116. That is, the workmen bought them themselves?

A. Yes. The factories did furnish some, but that was in the first initiating of those first stitchers; and the workmen bought a good many of them themselves. 20

x-Q. 117. What kind of a roll did you use at the Diamond Company for rolling the tread and adjacent portions of the fabric?

A. A roll of about inch and a half in diameter and two-inch face.

x-Q. 118. Was there any difference between that roll and the one you used for a similar purpose at the Goodyear plant?

A. There was not. 30

x-Q. 119. What sort of a roll did you use for rolling the beads at the Diamond plant?

A. We used a quarter-inch stitcher; inch and a half in diameter, quarter-inch face.

x-Q. 120. Like the one used at the Goodyear?

A. Like the one used at the Goodyear.

x-Q. 121. What did you use at the Diamond plant for putting the beads in position?

A. The beads in the Diamond plant were put on by 40

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the inspector, who put them on by a line marked on the tire with a compass—compasses.

x-Q. 122. Make a little scratch?

A. Make a scratch around the tire, yes, sir.

x-Q. 123. And fit the bead to that——

A. To that mark.

x-Q. 124. Scratch line?

10

A. Yes, sir.

x-Q. 125. Was there any difference between the beads which you used for the straight-side tires at the Diamond plant and the beads you used at the Goodyear plant?

A. Yes.

x-Q. 126. What was the difference?

A. Well, I can't exactly explain the difference; but they were not alike.

x-Q. 127. Can't you explain at all what the difference
20 was?

A. Well, the bead that we used at the Diamond plant was near round and was covered only with rubber, while the bead we used at the Goodyear was more of a "V" shape and was covered with fabric.

x-Q. 128. The bead you used at the Goodyear was almost triangular in cross-section, wasn't it?

A. Yes, sir.

x-Q. 129. Now, when you referred to the q. d. tires
30 with the linen bead at the Diamond Company, you referred to what is known as the "q. d. clincher tire"?

A. "Q. d. clincher tire," "quick-detachable clinchers."

x-Q. 130. And in that the bead is quite similar in shape to the clincher bead; but it will not stretch, it is inextensible?

A. Made of linen.

x-Q. 131. That's right?

A. Yes, that's right.

40

Cross-examination closed.

Arthur R. Mackey for Plaintiff—Redirect—Recross.

REDIRECT-EXAMINATION BY MR. ROGERS:

Rd-Q. 132. You say that you made 5-inch tires at the Diamond plant. Did you make 5-inch tires by the hand-spinning method or by the sawtooth method?

A. By the sawtooth method.

Rd-Q. 133. At the Diamond plant was it your custom personally to put on the rubber elements, like the cushion, tread, etc.?

A. Part of it was done by the builder, and part of it was done by a man called the "finisher".

Rd-Q. 134. And at the Diamond plant did you personally attend to putting the tire, with the rubber elements on it, in the mold, for the curing or vulcanizing process?

A. I did not.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. SEWARD:

Rx-Q. 135. What part of the rubber elements did you put on the tire carcass at the Diamond Company?

A. The cover and side wall.

Rx-Q. 136. By the "cover" do you mean the rubber layer that goes between the carcass and the breaker-strip?

A. Yes, sir.

Rx-Q. 137. I had that in mind when I used the word "cushion" a little while ago. Did you understand me so?

A. Yes; it was called either.

Rx-Q. 138. The breaker strip is a piece of loosely woven fabric that goes around the circumference of the tire, between the cushion and the tread rubber; is that right?

A. Yes, sir.

Recross-examination closed.

Deposition closed.

Signature waived.

Certificate of Notary Public waived.

Adjourned subject to new notice or agreement.

Arthur S. Browne for Plaintiff—Direct.

IN THE
UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY.

10	FRANK A. SEIBERLING,	}	In Equity No. 614.
	Plaintiff,		
	v.		
	THE JOHN E. THROPP'S SONS COMPANY,		
	Defendant.		

Testimony taken on behalf of the plaintiff, pursuant to notice and agreement of counsel, before WILLIAM J. DOLAN, a Notary Public, at 15 Broad Street, New York, 20 N. Y., beginning on Wednesday, July 28, 1920.

APPEARANCES:

ROBERT FLETCHER ROGERS and LUTHER E. MORRISON, Esqs., for plaintiff; and E. CLARKSON SEWARD, Esq., for defendant.

Whereupon ARTHUR S. BROWNE, a witness called on behalf of the plaintiff, being first duly sworn, in answer 30 to interrogatories propounded to him by Mr. Rogers, deposes and says as follows:

Q. 1. You are the same Arthur S. Browne who has already testified in this case?

A. Yes.

Q. 2. Please state, if you know, what kinds of rubber tires were in existence prior to the automobile.

A. Prior to the introduction of the automobile, there were no tires which were capable of general use on auto- 40 mobiles when introduced. There were in use two types of

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rubber tires. The first of these were solid rubber tires such as were used on ordinary carriages. There were also flexible pneumatic tires such as were used upon light vehicles, as bicycles and racing sulkies. These were generally known as "bicycle" tires, and being light as well as flexible, they were readily made by a number of processes.

Q. 3. Referring more particularly to the bicycle tire, 10 what was its principal characteristic?

A. Its most conspicuous characteristic was its extreme flexibility, which rendered it incompetent for severe use. It lacked sufficient stiffness or rigidity to enable it to retain its shape by itself. It could be turned inside out or folded up in any desired way, and only when it was inflated did it retain its usable shape. It resembled a collapsible bag. I here produce two specimens of old and well-known types of pneumatic bicycle rubber tires, 20 one of these being what is known as a "single tube" tire, and the other being the outer sheath of a double tube tire.

Plaintiff's counsel introduces in evidence the tires referred to by the witness, entitled "Plaintiff's Exhibit No. 9—Bicycle Tires".

Q. 4. Next please state the general characteristics and requirements of automobile tires, such as are the subject matter of the present controversy.

A. Automobile tires must be large, stiff and massive, 30 and no one of the usual simple processes of making bicycle tires is adequate to produce them. With automobiles, very great weights must be carried, running into tons, and as compared with bicycles, much greater speeds have to be endured, up to fifty or more miles an hour. Accordingly, they must be strong enough to sustain the enormous lateral twisting forces, such as arise in turning a corner under speed, where an accident to the tire might mean death to the occupants of the car. The automobile 40

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tires must be able to withstand the effect of the heavy pounding oscillations of the engine which produce violent strains on the tire in one circumferential direction, and they must also be able to resist powerful braking operations which produce circumferential strains in the opposite direction. That is to say, automobile tires have to sustain severe loads and strains in ever varying combinations and in all directions. A bicycle tire is, practically speaking, not subject to these conditions. For example, in rounding a curve an automobile remains with its four wheels in contact with the ground, whereas the rider of a bicycle tilts his body and the bicycle so that the bicycle rounds the curve at a tilt, thus avoiding the lateral strain which might tend to roll the tires off the rims of the wheels. In pedalling, the rider of a bicycle constantly varies the force applied to the road conditions which he meets, and the breaking pressure required to slow down the bicycle is small on account of the relatively small speed and weight.

Q. 5. What is it which gives the necessary strength and resistance in the automobile tire?

A. It is the carcass made up of superimposed layers of strong fabric. In the completed tire this carcass is concealed, because it is covered with various layers of rubber. This rubber covering is chiefly protective in its purpose and has little capacity in resisting strains or loads. The strength giving carcass is in the nature of a corded skeleton contained beneath the surface layers of rubber and it is the element which gives strength to the tire.

Q. 6. Would you say that the automobile tire is stiff or flexible?

A. Of course it has some flexibility, but its vital characteristic is its stiffness, since it is substantially permanent in structure and shape, both when in use and when detached. It is flexible in the sense that it can

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yield under strain while still transmitting the necessary power to propel the vehicle, somewhat in the same sense as a suspension bridge, but otherwise it is stiff and comparatively rigid so as to be adequate to sustain the load carried by it and to transmit the driving force. In these respects it may be likened to a leather trunk which is stiff enough to prevent injury to its contents, but can 10 nevertheless yield under severe shocks so as not to be broken or damaged under conditions of use. But the automobile tire is not flexible in the sense that it can be turned inside out, as in the case of the open sheath of a bicycle tire.

The purpose of the automobile tire carcass is to furnish lines of strong cords in such directions as to take all loads as uniformly divided between them as practicable. In this it may be likened to the suspension bridge, wherein there is a vast number of tie wires extending in such 20 directions and with such anchorages as to effect this result. Likewise, in the automobile tire there is a framework or carcass with a multitude of cords whose province is to divide the load equally among them.

The arrangement of the cords in layers of the automobile tire carcass is illustrated in Plaintiff's Exhibit No. 5, Fabric Shaped to Core, to which I referred in my former deposition. Each thread starts at one side of the tire from an anchorage at the lower edge or bead 30 (that being the portion which is subsequently in contact with the wheel rim), and it runs at an angle of about 45° across the upper portion or tread of the tire, and thence angularly to an anchorage at the opposite bead. This anchoring of the cords at the two beads, and the paths of the cords in diagonal lines from one bead across the tread to the other bead, is of vital importance since the power of the engine transmitted to the wheel rims imparts motion first to the tire beads in contact with the rim 40

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and then through the cords to the tread, which, by its contact with the ground, drives the car forward.

Not only must the cords of the fabric be laid in correct positions, but it is likewise important that the fabric should be smoothly laid. Wrinkles and uneven places are objectionable, because a wrinkle traps a certain quantity of air which expands when the tire is vulcanized, and
10 rapid wear of the carcass at this point results. Again, the effect of a wrinkle is to divert the strain-taking cords from their proper paths, thus making them slack, and hence preventing them from usefully taking the strains.

The relation of the carcass to the wheel rim is illustrated in the sketch which I here produce, which shows a perspective view of a small portion of the wheel rim and a section of a tire carcass connected therewith, with
20 appropriate legends to indicate the characteristic portions of the carcass.

Plaintiff's counsel introduces in evidence the sketch referred to by the witness, entitled "Plaintiff's Exhibit No. 10—Diagram of Carcass and Wheel Rim".

Q. 7. Are you familiar with the method of making tire carcasses by hand following the so-called "sawtooth method", as indicated in Plaintiff's Exhibit No. 7? If so, please describe it.

A. I am familiar with this method.

30 In practicing this method there is employed a revoluble ring-core or form, the surface of which has the shape in cross-section of the inside of the tire carcass. This is mounted on a swivel so that the core can be placed either in a vertical or a horizontal position. The core being placed in a vertical plane, the end of a piece of fabric from which a layer of the carcass is to be built, which has been previously made sticky by the impregnation of rubber, is secured to the core at one end, whereupon the
40 ring-core is held fast against rotation by a detent, and

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the operator forcibly pulls the fabric toward him. By a repetition of such pulls the central region or middle zone of the fabric, which is in contact with the central convex tread portion of the core, is stretched longitudinally with respect to the length of the fabric and circumferentially of the core. This action is illustrated in a picture which I here produce.

Plaintiff's counsel introduces in evidence the picture referred to by the witness, marked "Plaintiff's Exhibit No. 11—Manual Circumferential Stretching".¹⁰

The workman by his successive efforts stretches the central zone of the fabric so that it extends entirely around the core until the two ends of the fabric overlap each other. As I have observed this operation, the workman frequently finds that he has not sufficiently stretched the fabric to make the ends overlap, in which event he strips a portion of the fabric from the core and exerts a stronger pull until he has sufficiently stretched the fabric so that the two ends may overlap.²⁰

The result of this hand stretching of the middle zone of the fabric is to elongate this portion of the fabric so that the tread portion of the fabric conforms in shape to the tread zone of the core. The skirts of the fabric are not only unattached to the sides of the core, but they are left in a loose and baggy condition, as indicated at the attached end of the fabric in the picture to which I have just referred, Plaintiff's Exhibit No. 11.³⁰

To finish the application of the fabric to the core in a smooth and unwrinkled condition, this looseness in the fabric must be gotten rid of during the application of the skirts of the fabric to the sides of the core.

This is accomplished by the action of the workman with a hand held tool which is either a wooden spatula commonly called a "paddle", or else a "stitcher" consist-⁴⁰

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ing of a rotatable disk mounted in a handle. The principal and characteristic action of forming and shaping the loose skirts of the fabric to the sides of the ring-core is by the reciprocation of the paddle or stitcher by one hand of the workman in a direction which is at a small angle to the radius of the core, this reciprocation being effected for a short distance along one line and the passage by a more oblique path to another line, where this
10 substantial radial reciprocation is repeated, the paths along which the tool is moved being indicated in Plaintiff's Exhibit No. 7. As shown in this exhibit, the paddle or stitcher travels in a serrated path which resembles in form the periphery of a circular saw, which has given the name "sawtooth" to this method.

While the workman is reciprocating the tool by one hand, he holds on to the edge of the fabric, pulling it with his other hand so as to keep the fabric taut. The consequence is that the reciprocating movement of the paddle
20 gathers a small amount of fullness at each stroke, the tendency being to make a great number of little tucks or flat arches which are so skilfully formed that they are ironed out almost as a part of the act which produces them. In this way the workman stretches the fabric radially as he presses it against the side of the core. The radial stretching conforms the skirts of the fabric to the sides of the core in a manner analogous to that in which
30 the circumferential stretching fits the middle portion of the fabric to the tread portion of the core.

After the workman has finished one skirt of the fabric, which he has done with the core lying horizontal, he turns the core over and applies the second skirt to the opposite side of the core in the same way. To carry out this method successfully requires skill on the part of the workman and he is able to shape the skirts of the fabric to the sides of the core because of the complete freedom
40 of movement which can be imparted to the tool by the

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practised hand of the experienced workman, who can make it do what he wants at the exact place where he is working.

If the sides of the tire are not perfectly formed by this sawtooth manipulation, so that the fabric is not completely smoothed out, or if wrinkles or blisters remain, the defects are corrected by a hand stitcher, and may even be finally rolled down by a flat cylindrical roller. Doctoring of this description is resorted to in connection with all 10
tires, whether made by hand or by machine, although the necessity for doing this is reduced to a minimum by the machine of the State patent in suit. In the hand made tires, the amount of doctoring needed varies with the individual skill of the workman and the care and attention which he gives in making each tire.

Q. 8. Have you read the deposition of Mr. Waterman, defendant's expert?

A. Yes.

20

Q. 9. Will you say whether or not you agree in his statement that the machine of the State patent is non-automatic, while defendant's machine is automatic?

A. No.

Q. 10. Will you give your reasons for this answer?

A. The chief characteristics of the machine of the State patent in suit, which I discussed in my former testimony, have to do with the shaping of the skirts of the previously applied fabric onto the rapidly revolving core 30
by means of the spinning rolls which press the fabric against the sides of the core under the action of the strong spiral springs which the State patent says are preferably employed, and during this action the support of the spinning rolls is gradually advanced radially inward with respect to the core by a screw feed. The spinning rolls are arranged at a receding angle with respect to the plane of rotation of the core so that they do not become entangled with the skirts of the fabric, which fly 40

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outwardly under the action of the centrifugal force of the rotating core.

In defendant's machine, which I witnessed in operation, and as described in the Thropp & DeLaski patent No. 1,119,326, of December 1, 1914, the same operation is carried out by similar mechanism in a similar way.

In one respect the corresponding mechanism of defendant's machine may have an automatic action not set forth in the State patent in suit, since in defendant's machine there is provision for automatically moving the screw feed for the spinning roll support. But this automatic screw feed need not be used. The Thropp & DeLaski patent, in its description of the carriage upon which the spinning rolls are mounted, says:

20 "This sliding movement of the carriage 85 is effected by a screw 86 which is threaded into a nut 87 in the carriage 85, and which screw 86 is adapted to be rotated manually by a hand wheel 88 and mechanically by miter gears 89 and 90 driven from the shaft 12 through sprockets 91 and 92, chain 93, and clutch 94."

When the spinning roll is thus manually fed by the hand of the workman, there is no difference at all between the two machines, so far as automaticity is concerned, during the shaping of the skirts of the fabric upon the rapidly revolving core by the spinning rolls.

30 During the spinning down of the skirts of the fabric there need be no hand manipulation of the spinning rolls in either machine. They may be left under the control of the springs in the State machine, or, in defendant's machine, under the control of the weights which the State specification says may be used instead of springs (page 5, line 121 to page 6, line 2).

Or, in either machine, the workman may by hand supplement the action of the springs or weights by himself

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exerting additional pressure upon the carrying arms of the spinning rolls. Accordingly, in this respect there is no difference in automaticity between the two machines.

Q. 11. Will you compare the sequence and number of manual operations necessary in the two machines respectively, I mean more particularly with reference to forming the fabric about the sides of the core after it has been originally stretched thereon.

A. I will assume that the spinning rolls of the machine are in the position which they occupy after a layer of fabric has been completely applied to the core, so as to include the entire sequence of action, and that the machine is at rest. 10

In the first place, it is necessary to move the spinning rolls away from each other and from the core so that in the retraction of the carriage or support therefor, the spinning rolls will not drag upon the core or the layer of fabric thereon. This is done in the State machine by the workman pressing the spinning roll carrying arms apart and holding them apart. In defendant's machine, this is accomplished by first tightening up by hand the two set screws shown at 118 in Fig. 14 of the Thropp & de Laski patent, and as stated at page 5, line 45 thereof. Then, the hand wheel 117 is turned by hand "so that the arms 97 are spread away from the core 104 a sufficient distance to permit the arms to be advanced toward the core radially with respect thereto by means of the hand wheel 88 without engaging the periphery of the core", as stated at page 5, lines 48 to 54 of the Thropp & de Laski patent. 20
30

Then, in each machine, the spinning roll carriage is retracted by hand rotation of the feed screw until the spinning rolls are entirely out of the way of the core, so that the first layer of fabric may be stretched onto the core without interference by the spinning rolls.

Then, in each machine, after a layer of fabric has 40

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been stretched onto the core, the workman moves the clutch to bring the high speed mechanism into action so as to rotate the core rapidly.

Then, in each machine, the spinning roll carriage is fed forward by turning the feed screw by hand until the spinning rolls are brought to the position where they are first to act to press the fabric against the sides of the core.

10 During this manual advance of the spinning roll carriage, the workman, with the State machine, spreads the spinning rolls apart so that they will not scrape upon the fabric, and then he releases the spinning rolls to press upon the fabric when the carriage has been advanced to the desired position for initial action.

20 With defendant's machine, after the carriage has been advanced to bring the spinning rolls into the initial acting position, the two set screws 118 are unloosened by hand "so as to permit the arms 97 to act under the influence of the weights 103", as stated at page 5, lines 74 and 75 of the Thropp & de Laski patent.

If the automatic feed is to be employed in the defendant's machine, the workman moves the clutch 94, as shown in Fig. 14 of the Thropp & de Laski patent, so as to bring the automatic drive of the carriage feed screws into action.

In both machines, during the spinning down action the workman may supplement the pressure of the weights or springs by manual pressure.

30 In defendant's machine, the workman may, if he chooses, manipulate the two handles 139, shown in Fig. 14 of the Thropp & de Laski patent, so as to change the angle of the spinning rolls with respect to the plane of rotation of the core, which is an additional hand manipulation not having any counterpart in the machine of the State patent in suit.

At the completion of the spinning down action of the spinning rolls, in both machines, the workman shifts the
40 core rotating clutch so as to stop the rotation of the core.

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This completes the cycle of manipulation.

It will be seen by this résumé that there are more hand manipulations required in defendant's machine than in the machine of the State patent in suit.

NEW YORK, July 29, 1920.

ARTHUR S. BROWNE.

Present: Parties as before.

10

Q. 12. Say whether or not you agree with Mr. Waterman's theory as to the mode of operation set forth in the State patent in connection with the original application of the fabric to the core, in that portion of his answer to Q. 5 in which he discusses the operation of the State machine as indicated in Fig. 12.

A. As I understand Mr. Waterman, he assumes that Fig. 12 of the State patent shows the condition after the 20 stretching of the fabric onto the core has been completed, and on this assumption he reaches the conclusion that there is very little longitudinal stretch applied to the middle of the fabric as the result of the application of the fabric to the core. For example, after referring to the violent stretching of the fabric onto the core by the workman in the hand method of tire-making, Mr. Waterman says,

"The section of the core and fabric, as thus ap- 30
plied by a stretching process comparable to hand
making of tires, would not look at all like Fig. 12
of the State patent".

But, there is nothing in the State patent to suggest that Fig. 12 is intended to show the condition of the fabric either after complete application to the core as the result of the initial stretching; or, for that matter, to suggest that it shows the condition after the stretching has begun. On the contrary, a comparison between 40

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Fig. 12 and Fig. 2 of the State patent indicates that Fig. 12 shows the condition when the workman first brings the leading edge of the fabric into contact with the periphery of the core. Fig. 2 shows the condition which exists at the beginning of the stretching operation, and as there shown the illustrated side of the leading end of the applied fabric extends down below the curved side of the core, instead of being almost as high as the rim of the core, as shown in Fig. 12.

This notion of Mr. Waterman, that the State patent only contemplates a very light circumferential stretch, is entirely without foundation in the specification of the State patent in suit.

The State patent illustrates and describes a tension mechanism to resist the rotation of each fabric supply roll, which is competent to impart any amount of longitudinal stretch which is desired. This tension mechanism is particularly illustrated in Fig. 7 of the State patent drawings and tension is repeatedly referred to in the specification,—at page 1, lines 97 to 102; page 2, beginning at line 101 and extending through to line 33 of page 3; at page 3, lines 69 to 72; and at page 6, lines 106 to 114.

I call particular attention to the passage beginning at line 101 of page 2 of the specification, from which I quote as follows:

“The tension roll constitutes a highly important element since it secures the application of the several layers of fabric to the ring core with a uniform degree of tension.”

Then, after describing in detail the tension mechanism shown in Fig. 7, the specification says,

“If increased tension is desired on the tension-roller 36, the turn buckle 47 is manipulated so as to cause a contraction of the friction band 43 on the

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disk 42 to a determined degree, indicated by the gauge 46, so that a predetermined amount of resistance will be offered to the turning or movement of the tension-roller 36."

Accordingly, the State patent contemplates a tension mechanism adequate to stretch the fabric longitudinally to any desired extent, as it is drawn from the fabric supply onto the slowly rotating ring core. 10

Q. 13. How does your understanding of the original application of the fabric to the ring core compare with the following statement which Mr. Waterman made in an earlier part of the same answer, where he says,

"In the condition shown in Fig. 2, the workman would engage the low speed drive to revolve the core 115 slowly, thereby drawing the fabric from the supply and *stretching it at the same time*. A tension mechanism is provided for the tension roll 36, 20 which is seen at the left of Fig. 2 at 42, 43 and more in detail in Fig. 7 on the same sheet. The purpose of revolving the core by power is *to relieve the workmen of the physical strain of stretching the fabric, thereby getting a more uniform stretch.*" (Italics mine.)

A. This statement agrees with my understanding of the action.

Q. 14. And what about his theory, as set forth in 30 the same answer, as to the operation of the tread roll as particularly illustrated in Fig. 12a?

A. As I understand Mr. Waterman, he asserts that the shaping of the fabric to the tread zone of the core to the extent indicated in Fig. 12a is due simply to the action of the tread roll 141.

I do not agree with this.

The tension is competent to stretch the fabric circumferentially on the tread zone of the core to the extent 40

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indicated in Fig. 12a. But air bubbles may be trapped between the core and the fabric and it may not be wholly free from wrinkles. The purpose of the tread roll is to remove such air bubbles and wrinkles, and hence to shape such unformed portions of the fabric by thoroughly smoothing out the fabric at this zone.

This is what the State specification says. I quote as
10 follows:

“In the case of the tread-forming roll 141, this permits the operator to gradually bring the proper amount of pressure to bear on the canvas either which lies under or which actually forms the tire tread to thoroughly smooth it and shape it to the core.” (Page 5, lines 54 to 60.)

20 “It will thus be clear that after the operator has drawn a layer of rubber-coated canvas onto the ring-core, he can, by pressing the tread-forming-roll 141 against the fabric, smooth and shape the fabric on to the core and get it free of captured air bubbles or wrinkles over its outer face.” (Page 5, lines 83 to 89.)

Q. 15. Referring again to these theories of Mr. Waterman as to the very lightly stretched fabric and the subsequent forming action of the tread roll, have you observed any such mode of operation in the commercial
30 Goodyear machines which you have observed?

A. I have not.

Q. 16. I ask you the same question specifically with reference to the original State machine now in evidence, Plaintiff's Exhibit No. 2.

A. I have seen this machine in action and I have never observed any such action as Mr. Waterman talks about.

Q. 17. I next direct you to Mr. Waterman's testimony, in the same answer, to the supposed mode of operation of the State spinning rolls in forming the skirts
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of the fabric to the sides of the core, and particularly as illustrated in Figs. 12*b* and 12*c*, and ask you to state whether or not you agree with him, and give your reasons.

A. As I understand Mr. Waterman, his idea is that the spinning rolls of the machine of the State patent in suit act so lightly on the skirts of the fabric that they are counteracted by the centrifugal pull of the skirts of the fabric, so that the fabric immediately in contact with the spinning rolls is not pressed against the core and is not even in contact with the core. 10

I understand that Mr. Waterman bases this theory upon the showing of the two diagrams 12*b* and 12*c*.

Mr. Waterman does not quote any passage of the State specification in support of his contention, and he ignores the showing of Fig. 9 of the patent drawings. In Fig. 9, the spinning rolls are shown as pressing the fabric near its edges into contact with the core, although in this illustrated position, the controlling springs are at their weakest. 20

Figs. 12*b* and 12*c* to which Mr. Waterman alone refers in discussing his theory, are mere illustrative diagrams to give an idea of the mode of operation, and are adequate for this purpose.

But the specification repeatedly emphasizes the fact that the spinning rolls do press the fabric into contact with the sides of the ring-core. I will quote a few passages: 30

"Thereupon a pair of spinning-rolls by radial motion with respect to the ring core gradually *press* the canvas *in contact* with the sides of the ring-core toward its internal periphery to shape the sides of the tire." (P. 1, lines 57 to 61.)

"The spinning-rolls 147 are preferably mounted on ball-bearings or similar anti-friction mechanism for they revolve at high speed and exert considerable *pressure* on the fabric." (P. 5, lines 93 to 97.) 40

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10 “The spinning-rolls are also shown as spring-pressed toward the plane of the ring-core by springs 145, here shown, diagrammatically, as leaf springs although, in practice, *strong* spiral springs will be used. These springs exert the *pressure against* the fabric for forming it *against* the sides of the core which would be exerted by the arm of the workman in case of a hand-tool or a hand-pressed roll.” (P. 5, lines 108 to 117.)

20 “And it is of course understood that there may be substituted for the springs and as an equivalent therefor the more cumbersome device of a weight constantly tending to force the spinning-rolls, with considerable *pressure*, toward the ring-core. When then I say the spinning-rolls or their supports are laterally spring-pressed, I mean either spring or weight *pressed* laterally *against* the ring-core for, as before stated, a spring is the equivalent of a weight.” (P. 5, line 119 to p. 6, line 2.)

30 “In a broader aspect of my invention, however, I may employ mechanical instrumentalities, not the hands of the operator, other than springs or weights for *pressing* the spinning-rolls laterally *against* the ring-core. I shall, then, use the term ‘power-pressed’ to cover generally not only springs and weights but other mechanical instrumentalities for *pressing* the spinning-rolls *against* the ring-core. When I refer to my spinning-rolls as laterally yielding and no more, I mean to include any source of power for *pressing* the spinning-rolls *against* the ring-core, even the comparatively inefficient and irregular power contained in the hands of the operator.” (P. 6, lines 2 to 17.) In each extract the italics are mine.

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While in the majority of the claims in suit it is stated that the support for the spinning-roll is "laterally spring-pressed *toward* the core", in claim 13 it is specified that the support for the spinning-roll is "power-pressed *against* the ring-core".

It is thus unmistakable from the specification that the strong spiral springs, preferably employed, press the spinning-rolls against the intervening fabric which is 10 thus pressed against the sides of the core and that the pressure is such as would be exerted by the arm of a workman in case of a hand-tool or hand-pressed roll.

Q. 18. Referring again to this theory of Mr. Waterman, namely, that the rolls are held in a bight of the fabric by centrifugal force and out of contact with the core, have you observed any such phenomenon in your observation of the Goodyear commercial machine, or in Plaintiff's Exhibit No. 2?

A. I have not.

20

Q. 19. Mr. Waterman apparently seeks to emphasize the difference between this theoretical State mode of operation and that which obtains in the use of defendant's machine. Did you observe any difference in the operation of the two forms of machine in this respect?

A. I did not.

Q. 20. Mr. Waterman says that, as distinguished from the State mode of operation, the rolls of defendant's machine "squeeze" or "pinch" the fabric against the ring- 30 core. Do you find any use of the words "squeeze" or "pinch" in the specification of the Thropp & DeLaski patent?

A. I do not.

Q. 21. As a matter of fact, comparing the specification of the Thropp & De Laski patent with that of the State patent in suit, in which would you say this action of pressing the fabric against the side of the core is more fully described?

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A. Having regard to the descriptive portions of the two specifications, and omitting the claims from consideration, there is greater emphasis in the State patent than in the Thropp & De Laski patent regarding the pressure of the spinning-rolls against the core.

Q. 22. Referring to the claims of the Thropp & De Laski patent, what do you find in connection with this?

10 A. There are numerous claims in the Thropp & De Laski patent which use the language "against the core" in defining how the spinning rolls are pressed or held, and there are also many claims which state that the spinning rolls or forming elements are "pressed toward the core". The Thropp claims thus use the same two expressions which are used in the claims of the State patent in suit.

There are at least thirty claims which use the expression "toward the core".

20 Q. 23. You have spoken of the illustration in the State patent, and particularly in Figs. 12, 12a, 12b, 12c, as being diagrammatic. Is illustration of this character usual in patent drawings?

A. Yes.

Q. 24. From what experience do you make that statement?

A. From thirty-eight years experience in preparing and studying patents, during the course of which I have examined tens of thousands of patents.

30 Q. 25. Are patent drawings supposed to be made to scale, or to be exact, or in the nature of working drawings?

A. They are not.

Q. 26. Are you able to point out similar lack of exactness in any patent you have discussed?

A. Yes,—in the Thropp & De Laski patent there is an illustration. Figs. 1 and 2 of the drawings of this patent show that the shaft 115 which carries the hand-wheel
40 117 is located below the arm 108 which carries one of the

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slides for one of the spinning-rolls; whereas, Figs. 3 and 14 show this same shaft 115 above the arm 108. In this respect Figs. 3 and 14 are wrong and irreconcilable with Figs. 1 and 2.

Q. 27. Would you regard such a gross error as the one you have pointed out as sufficient to support an allegation of inoperativeness?

A. No. This is simply one of those common errors ¹⁰ which are to be frequently found in patent drawings and which can deceive no person capable of understanding the patent and who really wants, from the entire document, to obtain a correct understanding of how the machine is constructed and works.

Q. 28. What would you say as to the comparative seriousness of the showing in Figs. 12b and 12c in the State patent and the discrepancy, between Figs. 1 and 2 on the one hand and Figs. 3 and 14 on the other hand, in ²⁰ the Thropp & De Laski patent?

A. The error in the Thropp & De Laski patent is much more serious than the showing in the State patent. There is a positively irreconcilable error in the drawings of the Thropp & De Laski patent; whereas, in the State patent the draftsman simply failed to get his lines close enough together.

Q. 29. You have testified in your previous deposition to the fact that in the demonstration of defendant's ma- ³⁰chine, which you saw, the spinning-rolls advanced at a receding angle to the plane of the core. Mr. Waterman states at various places, as for instance in his answer to Q. 62,

"The fabric is then pressed against the core all the way to the inner edges by spinning rollers operating substantially at right angles to the surface of the core at all points and not at a receding angle", etc.

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What have you to say in this respect? You may, if you like, refer to the Thropp & De Laski patent.

A. The Thropp & De Laski patent shows in Figs. 14 and 15 the position of the spinning-rolls relative to the ring-core, and in both of these figures the spinning-rolls are at a receding angle to the plane of rotation of the core, as specifically described in the State patent. More-
10 over, I note among the Thropp & De Laski claims that several specify that the spinning-rolls or forming elements are "arranged to engage the core at an angle to the plane thereof" (claims 12 and 13).

Even if the workman should continuously vary the angle of these spinning-rolls so as to maintain them perpendicular to tangents of the surface of the ring-core, this receding angle of the spinning-rolls to the plane of rotation of the core would continue to be present until the spinning-rolls have been moved from the position shown
20 in Figs. 14 and 15 and they became parallel with each other.

In the exhibition of defendant's machine, which I witnessed preparatory to giving my former deposition in this case, the workman did not continuously shift the spinning-rolls so as to maintain them perpendicular to tangents of the ring-core surface, but the receding angle, substantially as shown in Figs. 14 and 15 of the Thropp & de Laski patent, was maintained until after the spinning-
30 rolls had passed the maximum width of the core and began to move inwardly along the decreasing diameter of the core, and he then made a single shift of the spinning-rolls, as I testified in answer to x-Q. 119 in my original deposition.

Q. 30. Mr. Waterman at several points in his deposition, for instance in his answer to Q. 5, states that he understands your theory to be that the "centrifugal force acts like invisible fingers pulling the fabric radially out-
40 ward thus forming a loop of the fabric adjacent to the

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core", apparently believing that such action would result in a tendency to pull the forming rolls away from the core. What have you to say as to the accuracy of his assumption?

A. Either Mr. Waterman misconceives the purport of my statements, or else I failed to express myself with clearness. I had supposed that I had made my meaning so clear, particularly in the course of my answers to x-Qs. 10 166 to 171, that it would be impossible for anyone, even desiring to do so, to fail to understand the facts which I was endeavoring to explain.

I think I can make my explanation unmistakable by reference to Fig. 12b of the State patent drawings. In this particular figure, the fabric is shown as stretched to the core down to the widest thickness of the core, and the unattached skirts of the fabric are illustrated as extending outwardly in a slightly curved path averaging a perpendicular to the plane of the core. This illustrates 20 a condition which is exhibited in the actual working of the rapidly rotating core, and the illustrated condition of the skirts of the fabric is due to centrifugal force.

The direction of the centrifugal force is, of course, radial with respect to the rotation of the core; and, if the fabric were perfectly free to adapt itself to the forces acting on it, then the unattached skirts would extend radially outward from the hinge line where they adjoin the already attached portion of the fabric. 30

But the fabric is not perfectly flexible, but on the contrary is relatively stiff, being a coarse duck or canvas fabric impregnated with rubber. Consequently, as a result of the centrifugal force acting upon the stiff skirts, the skirts do not stand out from the core radially, but in a curved path, this curved path varying in shape as the spinning-rolls progressively act.

Fig. 12b shows an intermediate stage in the laying down of the fabric.

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At the outset, when the spinning-rolls begin to act, the average angle of each skirt to the plane of the core is more acute than is shown in Fig. 12*b*. That is to say, the outer edge of the skirt is farther out toward the periphery of the core, as compared with the hinge of the skirt, than is illustrated in Fig. 12*b*.

10 At any given moment the effect of the centrifugal force acting upon the stiff fabric is to give the appearance, as though, figuratively speaking, invisible fingers were drawing the skirts away from the core.

The practical effect is that the centrifugal force maintains the fabric smooth and wrinkle-free at the portion where the spinning-rolls act upon it to progressively force the fabric in advance of the hinge line against the surface of the core, thereby causing adhesion between the rubber impregnated fabric and the core.

20 The action of the centrifugal force upon the fabric does not have the effect of moving the spinning-rolls outwardly from the sides of the core so as to hold the portion of the fabric with which each spinning-roll contacts away from the side of the core.

Q. 31. Mr. Waterman, at several points in his deposition, for instance in his answer to Q. 12, says that,

30 "The selection of 207 turns rather than say 200 turns or 205 turns per minute seems to indicate some special significance as though perhaps 207 might be a lower limit for the particular sort of operation discovered by the patentee."

State whether or not you find any such "special significance" in this selection.

A. I do not.

On the other hand, it is unmistakable from the language of the State patent that the particular speed of
40 207 revolutions per minute is given simply as an instance

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of a speed which will give the desired results. What the specification says, is—

“I have discovered, however, that it is not only possible but highly desirable to let the smoothing- and spinning-rolls operate upon the ring-core while this is moving at a much higher speed, say at two hundred and seven turns a minute. By this means the machine not only does more work in a given time but it does better work.” (P. 2, lines 4 to 11.) 10

As Mr. Waterman says, in answer to Q. 72, plaintiff's exhibit No. 2, State machine, had a high speed of about 230 R.P.M. when he saw it, and this agrees with my own observation.

I note that the 207 R.P.M. mentioned in the State patent is exactly ten per cent. less than the high speed of the actual machine.

Doubtless, the speed had been cut down ten per cent. at the time when the specification writer observed the machine he was describing, and the particular speed of 207 R.P.M. was given as an example which, if followed, would give the desired effects without necessitating any experimentation on the part of a person desiring to practice the invention. 20

Q. 32. I next direct your attention to Mr. Waterman's statement in reference to defendant's machine, as contained in Q. 66, to the effect that the core and spinning-rolls and connected parts are not constructed and coordinated for shaping and applying the previously unshaped sheeted fabric strip to that part of the core beyond the tread portion, coupled with the statement that the fabric is certainly very largely shaped by the stretching process before it is applied to the core. Do you agree with Mr. Waterman in this particular? 30

A. I do not.

Q. 33. Will you state whether or not this statement 40

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of Mr. Waterman correctly describes the operation you saw when defendant's machine was demonstrated to you?

A. It does not.

As I have already testified in my former deposition, on the occasion when I witnessed the exhibition of defendant's machine, the fabric was initially stretched on the ring-core for a sufficient extent to conform to the tread zone only of the core, leaving the skirts loose and baggy. The forming or shaping of these loose, baggy skirts to the sides of the core was exclusively done during the high speed rotation of the core by the action of the forming- or spinning-rolls.

Q. 34. Will you state whether or not this statement of Mr. Waterman correctly describes the mode of operation disclosed in defendant's patent, namely, the Thropp & De Laski patent?

A. It does not. On the contrary, the Thropp & De Laski patent describes the action of defendant's machine, which I witnessed.

The rolls 132 are repeatedly referred to in the descriptive portion of the specification as "forming" rolls. I note that they are so described in at least twelve different places, namely, page 1, lines 66 and 68; page 4, lines 26, 28, 49, 51 and 125; page 5, lines 59, 76, 88 and 110; and page 7, line 18.

In describing the mode of operation first of the stretching on of the fabric around the periphery of the core and then subsequently forming and shaping the material by the forming-rolls on the sides of the core, the Thropp & De Laski specification says

"After one layer of fabric has been thus stretched completely about the periphery of the core, it may be formed down about the sides of the core as follows:—" (P. 5, lines 43 to 47.)

Thus, it unmistakably appears that the initial stretching of the fabric is simply about the periphery of

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the core; and that the shaping or forming of the fabric about the sides of the core is effected by the forming-rolls 132, which the specification then goes on to describe.

A few sentences further along, the specification says—

“* * * the disk forming rolls 132 engage the friction fabric on each side of the core at *about the point where the fabric ceases to show its stretch due to the previous action of drawing it on the core.*” 10
(P. 5, lines 59 to 63.) (Italics mine.)

This shows that the fabric has been initially stretched only partly on the core and that the rest of the work is done by the spinning-rolls.

Further on, the specification says—

“As the core is rotated, the disk forming rolls will advance radially across the side thereof due to the action of the power driven screw 86, thus forming the fabric tightly about the sides of the core. 20
* * * *After the first sheet of fabric has been thus formed completely about the core by the stretching and about the sides of the core by the disk forming rolls, a second sheet of fabric may be drawn onto the core in a manner precisely similar to that already described.*” (P. 5, lines 76 to 90.) (Italics mine.)

Further on, the specification says—

“After this second strip has thus been stretched 30 on the periphery of the core superposed on the first strip of fabric, it may be formed down about the sides of the core by the disk forming rolls 132 as previously described.” (P. 5, lines 106 to 110.)

On the next page the specification says—

“After the bead cores have been thus placed in position, the bead placing rings may be removed from the core and another strip or layer of friction fabric 40

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stretched thereon and formed down about the sides of the core, as previously described." (P. 6, lines 10 to 15.)

Further on, the specification says—

10 " * * * the angle at which the disk rolls 132 engage the fabric on the core for forming it down about the sides thereof may be varied to a great extent." (P. 6, lines 105 to 108.)

It is thus unmistakable that the action is first to stretch the fabric around the periphery only of the core; and subsequently during the high speed rotation of the core to complete the shaping of the fabric by forming the unattached skirts down onto the sides of the core by the exclusive action of the forming-rolls.

20 Q. 35. Does this mode of operation, as described by you in your last two answers, in connection with the demonstration of defendant's machine and in connection with the disclosure of defendant's patent, vary materially from the mode of action disclosed in the patent in suit and in plaintiff's commercial machine?

30 A. It does not. The Thropp & De Laski patent speaks about *forming* the fabric onto the sides of the core by the forming- or spinning-rolls, while the State patent refers to the same action as *shaping* the fabric onto the sides of the core by the spinning-rolls. "Forming" and "shaping" are exactly equivalent expressions in this connection.

Q. 36. Regarding this theory of Mr. Waterman as to the mode of operation in defendant's machine, what do the claims of the Thropp & De Laski patent indicate in that respect?

40 A. The Thropp & De Laski patent has 148 claims. In these, the rolls 132 are referred to as "elements", "devices", and "mechanism," as well as "rolls". In 145 of the 148 claims it is recited that these rolls, however

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identified, are for "forming" the material on the core generally, or on the sides of the core, or, as specified in some of the claims (7, 8 and 9 among others), across the core or across the sides of the core. The remaining three claims,—50, 80 and 115,—while not using the word "forming", use an exactly equivalent expression. In each of these three claims there is specified a roll or mechanism "adapted to form the tire fabric" either "on the sides of 10 the core and over the bead cores", as in claim 50, or "on the core and over the bead cores", as in claim 80, or "on the core both under and over the bead cores", as in claim 115.

In thirty-one of the claims the rolls are specifically recited as "forming rolls"; and in forty-three claims the rolls are specified as "forming elements".

Also, there are thirty-four of the claims which refer to the initial "stretching" of the tire material onto the core. These are claims 34 to 66 inclusive and claim 137, 20 and in each case there is recited "means for stretching tire fabric on to the periphery of the core". In these claims the forming of the fabric onto the sides of the core is exclusively attributed to the forming-rolls.

Q. 37. Will you next compare generally the phraseology in this respect of the claims in suit with the claims of defendant's patent.

A. In each of the claims of the State patent which are involved in this suit, the function of the spinning-rolls is 30 recited to be to pass "radially along the sides of the tire shoe to shape the sheeted fabric on the core", as in each of claims 4, 5, 6, 7, 22, 23, 24 and 25, and a similar expression is used in each of claims 12, 13 and 26. Claim 12 specifies a radially moving spinning-roll for passing "radially over the side of the tire shoe to shape the fabric on the core". Claim 13 specifies a spinning-roll mounted on the support "to pass over the side of the tire shoe to shape the fabric on the core". And claim 26 specifies a 40

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spinning-roll passing "radially along the sides of the ring-core to curve and shape the sheeted fabric thereon".

Thus, in each claim the spinning-roll is specified as passing along the side of the tire shoe for the purpose of shaping the fabric to the core.

These claims thus define the office of the spinning-rolls in the same way as do claims of the Thropp & De Laski patent.

Q. 38. Referring next to the original State machine, Plaintiff's Exhibit No. 2, have you seen this machine in actual operation?

A. Yes.

Q. 39. Did the machine operate satisfactorily in applying the fabric to the sides of the core?

A. It did.

Q. 40. Did it operate according to the mode of operation disclosed in the State patent in suit?

A. It did, although the speed was somewhat higher than that given as an example in the State specification.

Q. 41. Have you read Mr. Waterman's answer to Q. 17, wherein he sets forth certain alleged differences between the Goodyear commercial machine and the machine of the State patent?

A. Yes.

Q. 42. Will you kindly say whether or not you agree with him in connection with his statements concerning the lateral stretching roll of the Goodyear commercial machine.

A. In the room of the factory of the Goodyear Tire & Rubber Company, at Akron, Ohio, where, I understand, Mr. Waterman saw the State machine in operation, there are twenty-four State machines. In fourteen of these machines the stretching rolls corresponding to the rolls 36 of the State patent are cylindrical, as are also the

lateral stretching rolls corresponding to the rolls 41 of

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the State patent. With these machines there would be none of the supposed pre-forming. In the other ten machines, the cylindrical metal roll 36 was enveloped by a rubber cover which was slightly greater in diameter at the middle than at the ends. The "barrel shape" thus given requires critical attention to be observed when covered by the fabric. The purpose of this slight longitudinal convexing of the rolls 36 is just the same as that in the "crowning" of a belt pulley, namely, to keep the fabric running straight. 10

Also, in these ten machines, a portion of the lateral stretching rolls 41 is likewise similarly larger in diameter in the middle than at the ends, and for the same reason.

I carefully examined fabric which had passed over these rolls 36 and 41 and was wholly unable to detect any shaping of the fabric thereby.

Q. 43. In the same answer, Mr. Waterman condemns the quality of the work done on these Goodyear commercial machines. What have you to say in that respect? 20

A. My own observation of the State machine at the Goodyear factory has been that the work has been well done, and uniformly so. Of course, once in a while a layer of fabric may require hand doctoring.

I have the ordinary car-user's experience with tires and know that the Goodyear tires give satisfaction.

Also, my personal observation of the work done by the machines is corroborated by the very large number of tires which have been made upon the State machines. 30

Q. 44. Would you say that these Goodyear commercial machines that you have observed are built and operated in accordance with the disclosure of the State patent in suit?

A. Yes.

Q. 45. You referred in your previous deposition to the spiral path pursued by the State spinning-rolls and defendant's forming-rolls in their traverse over the sides 40

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of the core. Are you able to produce a drawing or sketch indicating this spiral path?

A. Yes; I here produce such a sketch.

Plaintiff's counsel introduces the sketch in evidence, marked "Plaintiff's Exhibit No. 12—State's Spiral Path".

10 Q. 46. Have you read the translation of the Mathern Belgian patent, Defendant's Exhibit F?

A. Yes.

Q. 47. Do you note any differences in that translation from the translation you studied and discussed in *Seiberling v. Firestone Company*, with regard to the translation of the French words *déplissement*, *déplissage*, and *déplisser*?

A. Yes.

20 The Belgian patent uses the word "*déplissage*" three times, namely, at the last line of page 1, at line 29 of page 3, and at line 32 of page 4. It uses the word "*déplisser*" once, at page 2, line 28. It uses the word "*déplissement*" once, at page 5, line 24. In the translation made by the defendant in the *Seiberling v. Firestone* suit, the translation in each of these five instances was "unwrinkling".

In these five instances, the present translation gives
30 "removing the puckers" twice, "removal of the puckers" once, "removal" from the fabric "of the puckers" once, and "eliminating the puckers" once.

The present translation nowhere uses the word "wrinkle" or the word "unwrinkling".

Q. 48. Mr. Waterman expresses the opinion, as for instance in his answer to Q. 32, that the Belgian patent "discloses exactly the mode of operation practised with the Goodyear machines". Do you agree with him?

40 A. I do not agree with Mr. Waterman. On the

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contrary, there is no disclosure in the Mathern Belgian patent of the operation disclosed in the State patent.

Of course, in the light of the present knowledge of tire-making on the State machines, it would be now possible to take the machine of the Mathern Belgian patent, remove the "wrinkling" or "puckering" gears 36, or so use them as to be ineffective to perform the office which the patent sets forth; remove the side applying and cementing reciprocating rolls 30, or so employ them as to perform no useful office; stretch the fabric onto the tire so that it is only applied to the tread zone of the tire, and run the ring-core during the spinning down of the sides of the fabric at such a high speed as to maintain the fabric in an unwrinkled condition where the forming- and shaping-rolls act upon it. Should the machine be so used, then a workman sufficiently skilled to handle properly the spinning-rolls shown in Fig. 6 of the Mathern drawings could produce a usable tire carcass upon the Mathern machine.

Q. 49. Will you describe the construction and mode of operation disclosed in the Mathern Belgian patent under the translation, Defendant's Exhibit F?

A. In answering this question, I will not again describe the mechanical details of the machine which have already been described by Mr. Waterman, but I will limit myself to a consideration of the cooperating devices, which are employed in pre-forming the fabric before it reaches the ring-core; which stretch the fabric onto the core and cement its sides to the core; and the means which Mathern employs for effacing the wrinkles, puckers, or folds, however they may be denominated, after the fabric has been applied to the core.

The fabric is wound upon a supply drum or roller 18, and is regulated by an adjustable tension mechanism so that resistance is presented to the withdrawal of the fabric from the supply drum.

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The middle of the fabric first passes around the rolls 26, which are shown in the drawings as spherical, but which the specification says may be "spherical or oval in form". As the specification states, this produces "a slight lengthening of the middle of the fabric, which lengthening greatly facilitates the removal of the puckers" (I use here and elsewhere in my quotations the present translation).

- 10 Alongside the rolls 26 are conical gears 36, one at each side of the fabric, and concerning them the specification says that their "sole purpose" is "to produce a slight uniform puckering of the fabric strips at their edges, ensuring in advance a uniform contraction of the fabric at all points."

The described combined effect of the rolls 26 and gears 36 is to pre-form the fabric by stretching it at its middle and gathering it at its sides.

- 20 This action is referred to in claims 2 and 8 of the Mathern patent.

Claim 2 specifies "a set of gears and of spherical rollers for producing a uniform lengthening and convexing of the fabric, thereby facilitating the sticking of it to the core".

Claim 8 specifies winding the fabric strips on the core "after a preliminary lengthening and convexing".

- 30 This pre-forming of the fabric would facilitate the subsequent sticking of it to the core, since it would be partly conformed to the shape of the core, and this is what Mathern specifies in his second claim as the purpose of this pre-formation.

The pre-formed fabric is applied to the core while the core is rotating at its slower speed. After referring to the pre-forming, the Mathern specification says,

- 40 "Next the fabric is placed on the core, which is coated with a layer of rubber solution so that the fabric adheres well to it and may be pulled along by its rotary movement".

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The fabric is still under tension and due to this tension during its application to the ring-core, the effect would be to shape further the fabric to the periphery of the core and to cement the tread zone portion of the fabric to the periphery of the core.

While the fabric is being wound upon the core, the reciprocating rolls 30 are at work for the purpose of applying and cementing the fabric to the *sides* of the 10 core.

The action of these rolls 30 is referred to at four places in the Mathern specification, which first says,

"As the fabric is pulled along and unwound from the drum 18, it encounters the rollers 30 on the casing 28. This casing 28 encloses a vertical bent shaft 33, which actuates a slide 32 that is guided in the walls of the casing 28. This slide 32 carries two rods 31 at two joints. Each of these rods carries at 20 its extremity a roller 30, which advances and retracts on the core, so as to *stick to its straight or convex sides the fabric* which has just been placed there." (Italics mine.)

The function of the rolls 30, therefore, is to stick the fabric to *the straight or convex sides of the core*, that is to say, against the sides of the core whatever the shape may be, thereby cementing the sides of the fabric to the sides of the core. 30

Later on, the Mathern specification also refers to

"(b) of the principle of rollers 30 advancing and retracting in a radial direction while bearing on the core for *cementing the fabric on its sides*." (Italics mine.)

Thus, as the rolls 30 reciprocate back and forth in a direction which is radial with respect to the core, they bear on the sides of the fabric, pressing it against the 40

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core, and as the result the fabric is cemented to the core on its sides.

Again, referring to these same rolls 30, claim 3 of the Mathern Belgian specification specifies

10 “a device consisting of one or more sets of rollers carried by a carriage which receives, through a bent shaft, a reciprocating movement perpendicular to the axis of the core in order to *stick the fabric on the sides of the core*”. (Italics mine.)

Finally, referring to the result accomplished by these rolls, claim 8 of the Mathern patent specifies

 “(b) *sticking the fabric on the sides of the core*”. (Italics mine.)

20 Thus, the middle zone of the fabric is caused to adhere to the periphery of the core as the fabric is wound onto the core, and the reciprocating rolls 30 cause the adherence of the sides or skirts of the fabric to the sides of the core.

 The Mathern specification does not say anything about the speed of the ring-core during this application of the fabric to the periphery and sides of the core, but it evidently must be slow enough to permit the reciprocating rolls 30 to act effectively to apply and cement the fabric to the sides of the core.

30 Mathern does not illustrate or describe any power or other means for rotating the crank shaft 33 which reciprocates the side-cementing rolls 30. This shaft might be rotated by hand, in which event the winding of the fabric on the ring-core would be extremely slow in order to enable the reciprocating rolls to perform their described office.

 The result of these actions up to this point is to lay and apply the fabric onto the core with wrinkles, folds, 40 or puckers in it. Puckers, creases, or wrinkles have been

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intentionally made at the sides of the fabric by the conical gears 36 and wrinkles may exist in other portions of the fabric—inevitably so, if the spherical pre-forming rolls 26 shown in the drawings are employed.

Accordingly, Mathern then proceeds to remove the puckers or wrinkles from the fabric by the employment of the tool shown in Fig. 6, or by employing two of such tools at the same time at opposite sides of the core. 10

These tools are loosely suspended upon two of the pins 35 projecting from the vertically fed tool carrier 17. The sole described function of these tools shown in Fig 6 is to unwrinkle the fabric or to remove the wrinkles or puckers therefrom. The action of these tools is referred to in four places in the Mathern specification, all of which I will quote. First, the specification says,

“On the support 17, which constitutes a tool carrier, there is mounted a tool like that shown in 20 Fig. 6, which has a fork with a rounded roller set at an angle. The sliding tool carrier 17 is adjusted so that the roller comes to the level of the top of the core. Then the machine is set in operation and the roller is caused to descend progressively on the side of the core and all the way down to its base. Thus there is obtained the complete and rapid removal from the fabric of the puckers, the descending motion being produced automatically by the pawl 30 34”. (Italics mine.)

Thus the action of these rollers of the tools of Fig. 6, when two are employed simultaneously, is over the entire surface of the fabric, from the top of the core down to its base. Hence, wherever any puckers or wrinkles are located in the fabric, it is the intent of Mathern to remove them all by this comprehensive action of these tools.

Further on, the specification refers to the “invention” consisting, in “the manufacture of tires”,

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“(c) of the principle of the roller descending progressively on the core during rapid rotation and producing a *progressive removal from the fabric of the puckers* by eliminating the puckers from the point of their origin, this being performed in a single descending movement”. (Italics mine.)

- 10 Thus, each pucker or wrinkle which may exist in the fabric is acted upon at the point where it begins by the roller which acts throughout the fabric as far as the pucker extends.

Claim 4 of the Mathern patent specifies

- 20 “a tool carrier having rollers and arranged to move downward automatically and progressively, dependent on the rotation of the core, in order to progressively *efface the puckers* of the successive strips of fabric”. (Italics mine.)

Finally, claim 8 specifies

“(c) *eliminating the puckers formed*”.

The sole office of the rollers of Fig. 6 which is mentioned in the Mathern specification is the removal or elimination of puckers or wrinkles which are present in the fabric after it has been applied and cemented to the core.

- 30 But this removal of the puckers by the tools of Fig. 6 would be intolerably slow if the ring-core were rotated at the same slow speed which is employed during the drawing of the fabric on the core and the cementing of its sides by the reciprocating rolls 30. Accordingly, Mathern provides a speed changing mechanism so that the ring-core rotates twenty and one-quarter times faster (as Mr. Waterman has figured it out) during the removal of the wrinkles or puckers.

This mode of operation is strikingly different from
40 that of the State machine. State has no pre-forming of

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his fabric, and hence has nothing like the spherical or oval rollers 26 or the gears 36 of Mathern.

State does not cement the sides of his fabric to the sides of the core during the drawing of the fabric onto the core, as Mathern does. Accordingly, State has nothing like Mathern's reciprocating side-cementing rolls 30.

Mathern intends to put puckers into the sides of his fabric by his conical gears 36 so that after the fabric has been applied and cemented to the core it has puckers in 10 it due to the action of the gears 36, and it may have wrinkles in it too, all of which he subsequently endeavors to remove or efface by the action of the tool of his Fig. 6.

On the contrary, when State has stretched the fabric onto the core and his spinning-rolls are brought into action, the skirts of the fabric are free from the core and as the skirts are loose and baggy, in order that the spinning-rolls may act upon smooth surfaces of the fabric, the ring-core is rotated at a sufficiently high speed 20 to spread the skirts out and away from the core by the centrifugal force developed. Then, the carriage for the spinning-rolls is fed radially inward as the spinning-rolls act upon the progressively formed hinges between the attached and unattached portions of the fabric, so that the sides of the fabric are shaped, formed and cemented to the core as the result, exclusively, of the action of the spinning-rolls during the high speed rotation of the core.

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NEW YORK, July 30, 1920.

Present: Parties as before.

Q. 50. Do you know whether or not this plan of operation of Mathern, namely, the sticking of the fabric onto the core leaving wrinkles therein, and the attempt subsequently to eliminate them, was unique? If you have any authority bearing on this point please produce it. 40

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A. It was not unique with Mathern. I make this statement on the basis of the U. S. patent of William C. Stevens, No. 1,253,105, granted January 8, 1918, on an application filed April 12, 1913. In referring to what had been done prior to his invention, Stevens says:

10 “Heretofore, machines have been constructed in which the tread-portion of the tire-fabric has been overstretched in order to cause the ply to conform roughly to the contour of the core and to reduce the amount of fullness or surplus in the fabric to be cared for or absorbed at the sides of the core, but in the use of these devices, in addition to the objectionable and weakening excessive stretching, wrinkles and other defects have occurred in those portions of the fabric applied to the sides of the core, dependence being placed upon a subsequent elimination of

20 such wrinkles, either wholly or partially. The resulting detrimental effects of these defects thus occurring are not, however, completely overcome by the subsequent removal or smoothing out of the wrinkles or folds. In the operation of my improved machine, although the fabric is stretched only the required amount to maintain the finished tire-shoe or casing in normal shape and with proper strength, nevertheless, in applying the fabric to the sides of

30 the core, no wrinkles or similar defects are permitted to form. In other words, I avoid the effects of and presence of such defects in the completed tire-casing or shoe by preventing their occurrence as the fabric is smoothed down onto the form or core, rather than placing dependence upon an attempted elimination of such faults after they have occurred.”

40 Plaintiff's counsel introduces in evidence said patent, marked “Plaintiff's Exhibit 13—Stevens Patent”.

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Q. 51. What, if any, authority do you find in the Mathern Belgian patent for Mr. Waterman's assumption that the low speed of the Mathern machine may be four, six, or eight R.P.M., and the corresponding high speeds 81, 121½ and 162 R.P.M.?

A. None whatever. The Mathern specification is entirely silent on the actual speeds. The only information which the Mathern patent does give is that there are two 10 speeds, and the high speed is twenty and one-quarter times that of the low speed, as Mr. Waterman calculates it.

If the low speed were 1 R.P.M., then the high speed would be 20¼ R.P.M. Mathern's slow speed must be such as will permit the reciprocating rolls 30 to cement the sides of the fabric to the sides of the core throughout the entire circumference of the core, and this would necessitate, I should say, a speed as low as 1 R.P.M.

Q. 52. What, if any, authority do you find for Mr. 20 Waterman's repeated assumption that Mathern's Belgian patent is provided with spinning- or stitching-rolls?

A. None whatever.

Mr. Waterman, as I understand him, ascribes to the roller of Fig. 6 of the Mathern patent exactly the same office as is performed by the spinning-rolls of the State patent. But the spinning-rolls of the State patent act upon the centrifugally thrown out skirts of the fabric and form, shape and cement them to the sides of the core, 30 and have no office at all of removing wrinkles or puckers in an already applied portion of the fabric. On the other hand, the Mathern specification nowhere contains any description of any shaping, forming or cementing office of the roller of his Fig. 6, the only office which he does ascribe to that roller being the removal or effacing of wrinkles or puckers.

Q. 53. What, if any, authority do you find in the Mathern Belgian specification for Mr. Waterman's as- 40

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sumption that the patent discloses "automatic means for feeding the spinning-rolls inward radially"?

A. Mathern does have an automatically fed tool carrier 17 with laterally projecting pins 35 upon which the tool of Fig. 6 can be suspended. But, as Mr. Waterman himself says, in answer to Q. 31—

10 "The spinning rollers arranged as shown in Fig. 6 are very cleverly devised so that they merely hook over journal pins 35. They are guided and pressed to the work by the hand of the workman applied to handles thereon as clearly appears in Fig. 6. It results from this mode of mounting not only that they are readily applied and removed, but that if they encounter an obstacle while being positively fed downward, they simply lift from their pivots. Thus if they should happen to come down on top of the
20 core, they would lift instead of jamming and breaking something. Similarly if they should run against the bead after it had been applied, they would lift instead of forcing the bead out of place."

It is hence evident that by reason of its open hook embracing a pin 35, the tool of Fig. 6 is neither automatically nor positively fed downward.

For example, if the workman who has hold of the tool handle keeps the tool in a definite vertical position, the
30 tool carrier slide will feed downwardly without imparting any feed at all to the tool and would ultimately feed down far enough to remove entirely the lateral pin 35 from the open hook of the tool. The workman himself must perform the act of feeding the tool downward. The only function of the slide 17 and its pin 35 with respect to the feed of the tool is that it prevents the workman feeding the tool down too fast. The tool cannot slip in the hands of the workman and go down too far. But the
40 progressive and gradual radial advance of the tool, while

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limited by the tool carrier, is due solely to the conscious act of the workman. The workman, therefore, must feed the tool ahead at the same time that he is pressing its roller against the fabric, and is preventing the tool from being tilted in the plane of the core's rotation.

Q. 54. Mr. Waterman refers to the slide which carries the pair of rolls 30 as reciprocated "a short distance" back and forth. What, if any, authority do you find for this statement?

A. None whatever.

The specification of the Mathern patent refers to the bent or crank shaft 33 as the instrumentality for reciprocating the rolls 30, and the Mathern drawings show a sufficient crank throw to give a long reciprocation to the rolls 30 relatively to the sides of the core.

Perhaps Mr. Waterman's idea is that the rolls 30 can be reciprocated only to the extent of the length of the guide slot for their carrying bar 31, which is shown in Fig. 1 of the Mathern drawings. The length of this slot is less than the throw of the crank shaft 33. Accordingly, if this slot does limit the reciprocation of the rolls, then the shaft 33 would have to be rocked back and forth, involving a slower operation and hence slower rotation of the ring-core than if the crank shaft would be continuously rotated. I note, in this connection, that in "Defendant's Exhibit H—Machine of Mathern Belgian Patent", the crank shaft is rotated around and around and there is no limitation of the reciprocation of the rolls by the guide slots. Assuming, therefore, that in this respect Defendant's Exhibit H is a correct representation of the Mathern Belgian patent, then the crank throw shown in the Belgian patent is ample to reciprocate the rolls 30 throughout the entire width of the sides of the core. Thus, they are competent to perform the office ascribed to them in the Mathern specification.

Q. 55. Referring to the tool of Fig. 6, Mr. Waterman

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says "that it is impossible for these rollers to act on the tread portion as they would simply be lifted off from their supports"; and again, that they "therefore act on the side of the core where the fabric has not been previously formed by stretching". What, if any, authority do you find in the Mathern Belgian specification for these statements?

10 A. None whatever.

On the contrary, the Mathern specification, as I have already quoted, says—

"The sliding tool carrier 17 is adjusted so that the roller comes *to the level of the top of the core*. Then the machine is set in operation and the roller is caused to descend progressively *on the side of the core and all the way down to its base*". (Italics mine.)

20 The workman can maintain the roller of Fig. 6 in operative contact with any portion of the fabric at any portion of the core, even though the feed slide carriage does feed ahead, since the maintenance of the hooks of the tool in any definite vertical position with relation to the corresponding pins 35 on the slide 17 depends on the workman himself.

Q. 56. Mr. Waterman, in answer to Q. 31, in describing the supposed mode of operation of the Mathern Belgian machine, says:

"He then by means of the hand wheel adjusts the position of the slide 17 so as to bring the spinning roll of Fig. 6 about to the level of the top of the core. He then starts the machine and assumes the position for holding the handle of the spinning tools, there being two of these, one for each side of the core. By the time he has assumed this working position and is ready to apply pressure, after having started the machine, the spinning rolls will have

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reached the proper level to begin action and the operator presses them heavily against the core thereby pinching the fabric between the spinning rolls and the core and spinning it smoothly into shape simultaneously applying it to the cemented surface of the core."

What, if any, authority do you find in the Mathern Belgian specification for this assumption? 10

A. None whatever. There is no suggestion in the patent that any interval intervenes after the machine is set in operation and while the workman is doing something else to enable a sufficient feed of the tool carrying slide 17 to bring the rollers of Fig. 6 down to "the proper level to begin action". What the Mathern specification says is—

"The sliding tool carrier 17 *is adjusted so that the roller comes to the level of the top of the core.* 20 Then the machine is set in operation and *the roller is caused to descend progressively on the side of the core and all the way down to its base*". (Italics mine.)

One act immediately follows the other.

There is no suggestion of an idle interval during the rotation of the core.

Furthermore, your quotation from Mr. Waterman contains the statement that as the roll of Fig. 6 travels down- 30 ward it spins the fabric "smoothly into shape simultaneously applying it to the cemented surface of the core." There is nothing of this sort described in the Mathern patent. There is no reference to any spinning-down action of the roll of Fig. 6; no suggestion that such roll has any office whatever in applying any portion of the fabric to the cemented surface of the core; and no suggestion that any shaping of the fabric to the core is performed by that roll. On the contrary, the only office 40

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which the Mathern specification ascribes to the tool of Fig. 6 is to remove or efface puckers or wrinkles already in the fabric.

Q. 57. I call attention to the following statement of Mr. Waterman in his answer to Q. 31:

10 “Thus I find from this comparison that the Mathern machine supplies all of the tire making instrumentalities furnished by the State machine, but whereas the State machine is a mere aggregation of the tools, the Mathern machine has automatic feeding means making it in a real sense an automatic machine, as distinguished from an assemblage of tools.”

What, if any, authority do you find in the Mathern Belgian specification for this statement?

20 A. The machine of the Mathern patent does not automatically feed the tool of Fig. 6, for reasons I have already stated. All that the radially movable tool carriage 17 does when the tool of Fig. 6 is employed, is to prevent the workman feeding the tool too fast.

Q. 58. I call your attention to the following statement of Mr. Waterman referring to the conical gears 36:

30 “These gears are not described as having any important or essential function but are merely auxiliary refinements”.

What, if any, authority do you find in the Mathern Belgian patent for this statement?

A. None whatever. It would be just as accurate to say that any other feature of the machine was an auxiliary refinement. The Mathern specification places as much stress upon these gears as upon any other part of his machine, and they or their office are referred to in two of the claims.

40 Q. 59. Mr. Waterman, in answer to Q. 31, says that,

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in describing the gears 36, the Belgian specification states that there are "a pair of such conical gears on each side". What, if any, authority do you find for this statement?

A. None whatever.

The Belgian patent merely shows and describes one conical gear for each side of the fabric. Nowhere does the Belgian specification mention "a pair" of gears on "each side".

Mr. Waterman does not point out any such language in the Belgian specification, and the showing of the Belgian drawings is unmistakable. Fig. 1 shows a side view of the machine. It illustrates the two spherical rolls 26 and a single conical gear 36 with its axis midway between the axes of the rolls 26. The illustrated support for the rolls and gear in Fig. 1 would be wholly incompetent to support a second gear alongside the gear shown. The specification refers specifically to these gears in two places. After referring to the rolls, it says

"On the same support there is mounted at each side two conical gears 36".

If this statement stood by itself it would be ambiguous, because it might mean either that there were two gears at each side, or that there were two gears altogether, one at each side. But this sentence must be taken in connection with the drawings which are being described and to which the reference numeral 36 refers, and when this sentence of the specification is read, looking at the drawings, the ambiguity disappears and it is unmistakable that there are but two gears, one at each side.

But the specification leaves the matter beyond possibility of misinterpretation, even by one wishing to misunderstand, since further on, it says:—

"The control systems of the several mechanisms may differ from those described above, but the invention comprises the application in the manufacture

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of tires (*a*) of the principle of *two* rollers 26 and *two* side gears, which prepare the fabric". (Italics mine.)

In other words, there are just as many gears 36 as there are rollers 26, and the statement of number here made corresponds exactly with the drawings showing them, *two* (not four) rollers 26, and *two* (not four) gears 36.

Q. 60. I also refer you to Mr. Waterman's statement (Q. 69) that the machine of the Belgian patent operates "satisfactorily with the action of the rollers 30 omitted, the fabric being properly stretched on the core". What, if any, authority do you find in the Mathern Belgian specification for a statement of this character?

A. There is no suggestion in the Mathern Belgian specification that the rolls 30 can be omitted.

Q. 61. I call your attention to the following statement of Mr. Waterman (Q. 32), referring to the Belgian patent and the Goodyear machine,

"Thus in both the fabric is stretched into partial conformation with the core and the tread portion rolled into intimate contact therewith".

What, if any, authority do you find in the Mathern Belgian specification for this statement?

A. None whatever.

Mr. Waterman is here apparently referring to the action of the tread roller 141 shown in the State patent. The State commercial machine also has a tread roller which acts upon the tread zone of the fabric on the core. Mathern describes nothing of the sort. Mathern's rolls 30 do not act upon the tread portion of the fabric, but are solely described as acting upon the sides of the fabric and the sides of the core.

Q. 62. Referring to the translation of the Mathern

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Belgian specification, and more particularly to the following sentence thereof

"The fabric, on leaving the drum, passes between two rolls that are spherical or oval in form and arranged in such a manner as to produce a slight lengthening of the middle of the fabric, which lengthening greatly facilitates the removal of the puckers."

10

I will ask you to state what you understand by the particular words, "which lengthening greatly facilitates the removal of the puckers".

A. The lengthening referred to is that which is due to the stretching of the fabric at its middle by the action of the rolls 26, so that the fabric is laid onto the core in a partially formed condition. Consequently, there is less danger of the fabric wrinkling in the immediate vicinity of the periphery of the rim of the core than would be the case if there were no longitudinal stretch. For example, to take an extreme case, assume that the fabric should be wound around the core without any longitudinal stretch at all. In that event all portions of the fabric except along the median peripheral line of the core would be loose and baggy. Then, if the fabric should be simply laid down upon the sides of the core, it would be full of wrinkles all starting at the median peripheral line. Such wrinkles would be removed with difficulty.

Therefore, any longitudinal stretch of the fabric, either before or as it is applied to the periphery of the core, reduces the liability of the formation of wrinkles, minimizing the size of such wrinkles as are formed, and hence the elimination of wrinkles as are formed is facilitated by the lengthwise stretch.

As I understand Mr. Waterman, the only "puckers" which are to be removed are those which are due to the action of the conical gears 26. From his view, as I understand it, there was nothing else in the nature of a wrinkle

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elsewhere in the fabric to be removed or effaced after application of the fabric to the core.

But, this is wholly inconsistent with the passage of the specification under consideration. At the very time that Mathern is stretching the fabric along the middle by the rolls 26 to facilitate the removal of "puckers" he is trying to put "puckers" into the edges of the fabric by means of the bevel gears 36. This stretching of the fabric at the middle, therefore, can have nothing to do with the subsequent removal of such puckers as may be formed by the conical gears. Therefore, the "puckers" whose removal is facilitated by the longitudinal stretching of the middle of the fabric are those which occur or may be formed in the body of the fabric, as distinguished from that portion of the sides of the fabric upon which the conical gears act.

Since, therefore, under the mode of operation set forth in the Mathern patent, the wrinkles or puckers may exist at any part of the fabric, Mathern starts the action of his unwrinkling or unpuckering tool at the top of the core, as the specification particularly says is the case.

I note, in this connection, that the translation produced by defendant in the Firestone case at this point in the specification construes the expression "*allongement facilitant de beaucoup le déplissage*" as "elongation greatly facilitating the *unwrinkling*". This accords with the action which does take place.

I also note that Professor Spiers also testified that the word "*déplissage*" is more properly to be translated as "*unwrinkling*".

Q. 63. If I understand you correctly, the Mathern Belgian specification describes the use and purpose of the conical gears 36 as to form puckers at or near the edges of the fabric in order to contract or convex it approximately to the shape of the core. What have you to say in this connection as to Mr. Waterman's assumption that

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the tool of Fig. 6 is to be used on the fabric in conjunction with the core when the latter is rotating at high speed, approximately that of the State commercial machine?

A. Mathern's pre-contraction of the edge portions of the fabric by the intended initial performance of the conical gears 36 is wholly inconsistent with the subsequent employment of the ring-core rotating at anything approximating the commercial speed of the State machine, namely, at about 125 R.P.M. Should any such speed be employed, the unattached skirts of the fabric would fly outwardly away from the core under centrifugal force, thus destroying the effect intended by the puckering of the fabric along its edges. It would be wholly senseless first to pre-shape the fabric to the approximate shape of the core, and then immediately after destroy the shape which pains had been taken to secure.

Q. 64. What do you know about the subsequent history of the Mathern Belgian patent?

A. I am familiar with the taking out of Belgian patents and the steps necessary to keep them alive. Under the Belgian law at the time of the grant of the Mathern patent, the life of Belgian patents was subject to the payment of annuities. Any annuity could be paid within one month after the anniversary of the patent. An annuity fell due on the Mathern Belgian patent in 1907 and was payable on or before October 20, 1907. This first annuity amounted to twenty francs, less than four dollars. Also, under the Belgian law, at any time within five months thereafter the annuity could have been paid with an additional fine of ten francs. The final period for paying the annuity and the fine expired on March 20, 1908.

The data effecting incidents regarding Belgian patents are published in the official publication "Moniteur Belge". This publication, in the issue of August 9, 1908, shows that the first annuity of twenty francs was

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not paid and that the Belgian patent lapsed on its first anniversary.

Plaintiff's counsel introduces in evidence a certified copy of the portion of the "Moniteur Belge" referred to, marked "Plaintiff's Exhibit No. 14—Moniteur Belge".

10 Q. 65. I will ask you to examine the Mathern German patent, "Ausgegeben den 26, Januar 1909", Defendant's Exhibit O, and say whether or not you agree with Mr. Waterman's statement to the effect that this patent "shows a machine which in all of its major features is substantially the same as that which I have already described in considering the Belgian patent".

A. I do not agree with Mr. Waterman.

20 I will not describe this patent in detail because I am advised by counsel that it is not of a sufficiently early date to be a part of the prior art affecting the State patent in suit.

I will simply call attention to the conspicuous differences between this German patent and the Mathern Belgian patent, which are as follows:

30 1. The Belgian patent illustrates and describes two of the conical gears 36. The German patent shows and describes *four* of these gears, two at each side of the spherical rolls 26. Fig. 4 of the German patent illustrates this arrangement of gears and there is no figure in the Belgian patent drawings corresponding to it. The single conical gear 36 for each margin of the fabric, as shown and described in the Belgian patent, was probably incompetent to effect the desired contraction, whereas, a pair of gears at each side, as shown in the German patent, could doubtless be made to pucker the fabric and cause its circumferential contraction.

40 2. The German patent omits altogether any tool like that of Fig. 6 of the Belgian patent, having no correspond-

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ing figure in the drawings and saying nothing about such a tool in the specification.

3. The German patent introduces an altogether new feature, namely, an oscillating sector or cradle carrying a series of stepped rollers 38. This sector or cradle 29 is oscillated back and forth in an arc concentric with the axis of rotation of the ring-core so that each of the several stepped rollers always acts on the fabric at a definite distance from the axis of rotation of the ring-core. No one of these stepped rollers has any radial movement with respect to the plane of the ring-core and accordingly no one of these stepped rollers has any action or movement similar to that of the roller of Fig. 6 of the Mathern Belgian patent. 10

4. In the described operation of the machine of the Mathern Belgian patent, the ring-core makes several (probably many) rotations during the unwrinkling or pucker-removing action of the tool of Fig. 6. On the contrary, in the German patent the ring-core (although then rotating at its higher speed) makes but a single complete revolution during the action of the stepped rollers 38. 20

The German patent retains the reciprocating side rollers 30 and the spherical or oval rolls 26.

Q. 66. If I understand Mr. Waterman correctly, he treats the gears 36 and the rolls 30 of the Belgian patent as of small importance, and regards the tool of Fig. 6 as Mathern's principal operative instrumentality. Is this assumption of Mr. Waterman supported by the German patent? 30

A. On the contrary, the German patent has the exact reverse effect.

In answer to Q. 31, Mr. Waterman says that the conical gears of the Belgian patent "are not described as having any important or essential function but are merely auxiliary refinements". The German patent, however, 40

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not only retains these gears, but renders them efficient by the improvement of having two conical gears for each side of the fabric.

10 In answer to Q. 69, regarding the action of the machine of the Belgian patent, Mr. Waterman says that "the machine operated satisfactorily with the action of the rollers 30 omitted, the fabric being properly stretched on the core". Mathern, however, did not omit the rolls 30 when he came to take out his German patent, but retained them.

On the other hand, the tool of Fig. 6 of the Belgian patent, to which Mr. Waterman ascribes the offices of shaping, forming, applying and cementing the sides of the fabric to the core, Mathern discarded altogether when he came to take out his German patent.

20 Q. 67. Have you examined the French patent to Hernandez, Defendant's Exhibit P, which was granted January 8, 1909, and published March 19, 1909?

A. Yes. However, I consider it unnecessary to discuss this patent because I am advised by counsel that because of its date this French patent does not constitute a part of the prior art in respect to the State patent in suit.

Q. 68. Have you examined the U. S. Patent to Vincent, No. 794,473, Defendant's Exhibit J, and have you read Mr. Waterman's testimony in connection therewith?

30 A. Yes.

Q. 69. Will you state whether or not you agree with Mr. Waterman's conclusions as to this Vincent patent?

A. Yes, with one possible exception. In referring to the hammers 30 of this patent, Mr. Waterman in answer to Q. 43 says,

40 "These hammers act progressively radially inward as the core with the fabric applied to it rotates thus laying the fabric smoothly against the core with a progressive inward radial action."

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If this simply means that the different hammers are arranged at different distances from the axis of rotation of the core, then I agree with Mr. Waterman.

If, however, he means that each hammer has an inward radial movement so that the hammers collectively have a progressively inward radial action, then I do not agree with him, because no one of the hammers has any radial component of movement, and accordingly each hammer is incompetent to have any radial stretching action upon the fabric. 10

Q. 70. How about the effects on the fabric of any centrifugal force in this Vincent machine?

A. The ring-core of the Vincent machine is rotated slowly at all times by the illustrated worm drive. There is, therefore, present no such rotation as would cause the fabric to fly stiffly outward away from the core. Moreover, the hammers would prevent any such flying out of the fabric because they extend all the way over the sides of the fabric. 20

Q. 71. In describing this Vincent machine, Mr. Waterman (Q. 43) says that "it stretches the fabric so nearly to the final shape that spinning rolls are not necessary". And again, that "the canvas thus goes on the core already stretched substantially in shape". What is the effect on the fabric of the stretching thus described?

A. The effect is to leave the margins of the fabric substantially unstretched so that the reticulations thereof when applied to the core would be in their original square condition. In all other parts of the fabric from the margin of the fabric up to the top of the core, the reticulations would be of diamond shape with the long axis of the diamond extending circumferentially and increasing in length gradually from the margin of the fabric up to the top of the core, where the elongation of the diamonds circumferentially would be most pronounced. 30

This would involve excessive stretch on the middle of 40

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the fabric with consequent danger of weakening it at the tread zone.

Q. 72. Does this method of forming the fabric to approximately its final shape by circumferential stretch alone resemble the mode of operation embodied in the State patent in suit and in defendant's machine?

10 A. It does not. Both in the machine of the State patent in suit and in defendant's machine, the tread zone of the fabric is shaped by circumferential stretching and the sides of the fabric are formed by radial stretching due to the action of the spinning-rolls.

Q. 73. Have you read the U. S. patent to Seiberling & Stevens, No. 762,561, Defendant's Exhibit K, and Mr. Waterman's testimony in regard thereto?

A. Yes.

20 Q. 74. Please state whether or not you agree with his conclusions.

A. I agree with Mr. Waterman, except in the following matters:—

Mr. Waterman refers to the creasing rolls 91 shown in Fig. 4 of the Seiberling & Stevens machine as "radially acting stitching rollers" and as "radially movable with respect" to the sides of the tire. These rollers 91 are "sharp edged", as stated at line 118, page 3 of the specification, and their sole function is to crease the fabric at its margin, as stated in the specification as follows:

30

"After passing this smoothing device the fabric must then be tucked into a crease which exists near the lower end of the core and forced there with considerable pressure to cause it to adhere until it is desired to remove the finished shell from the core. This creasing of the fabric in the manufacture of tires is known to the trade as 'stitching'." (P. 3, lines 98 to 106.)

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This sharp edged creasing and stitching roll 91 cannot have any radial action because of the mounting shown in Fig. 4. If the handle is moved upwardly from the position shown in Fig. 4, the first effect is to spread the creasing rolls 91 apart from each other so as to free them from contact with the fabric on the core. Then, further lifting of the handle swings the carrying arm 89 upwardly on its pivot 88, during which movement the left-hand creasing roll rises twice as fast as does the right-hand creasing roll, by reason of the different distances from said pivot where they are respectively carried by said support 89. Accordingly, these creasing rolls do not move radially and could not possibly act to stretch the fabric radially as is done by the spinning-rolls of the State patent in suit. Moreover, these creasing rolls have sharp edges which would preclude their employment as shaping-rolls to shape the sides of the fabric to the core, since they would injure the fabric if so employed. 10 20

Also, at the close of his answer to Q. 44, Mr. Waterman says that these creasing rolls "act on the inner portions of the fabric after the tread roll has acted thereon". Literally this is true, in that the action of the tread roll in smoothing the periphery of the fabric upon the tread zone in the fabric does occur at a stage preceding the action of the creasing rolls. But between these two actions the reciprocating jigger fingers 85 have performed their office and the sides of the fabric have thus been shaped to the sides of the core. Also, it is here to be noted that the tread roll 17 constitutes the driver for the ring-core and the tread roll is performing its driving office while the creasing rolls are tucking the fabric into the crease. 30

In this same answer, referring to the Seiberling & Stevens machine, Mr. Waterman says, "Thus, the machine may, like the State machine, have a high and low speed drive". There is no statement in the Seiberling & Stevens 40

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patent that there is any change in speed of the ring-core after stretching the fabric onto the core and before the reciprocating jigger fingers 85 are brought into action. There is no statement in the Seiberling & Stevens patent that any such speed of the ring-core is ever obtained as would result in pulling out the skirts of the fabric stiffly by centrifugal force.

- 10 Q. 75. Which mode of operation do you find embodied in this Seiberling & Stevens machine,—that which relies upon circumferential stretch alone for the formation of the fabric, or the one which relies partly on circumferential stretch and partly on radial stretch?

NEW YORK, July 31, 1920.

Present: Parties as before.

- 20 A. The latter. Circumferential stretch is obtained when drawing the fabric onto the ring-core. Radial stretch on the skirts of the fabric is achieved by the reciprocating action of the jigger fingers 85.

Q. 76. Have you read the U. S. patent to Moore, No. 518,112, Defendant's Exhibit L, and Mr. Waterman's testimony in respect thereto?

A. Yes.

- 30 Q. 77. Will you state whether or not you agree with his conclusions?

A. I do not agree with Mr. Waterman. The machine of the Moore patent and the way it is used are so totally unlike the State machine and the way it is used, and Mr. Waterman gives such an inadequate explanation of the Moore machine, that I can best explain wherein I differ from Mr. Waterman by giving a description of the way in which the Moore machine is used.

This patent is dated April 10, 1894, at which time
40 automobiles were unknown in the United States, and the

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stated object of the invention is "to provide a machine on which the shoes or covers of the pneumatic tires used on the wheels of bicycles &c., may be conveniently and expeditiously manufactured". (P. 1, lines 11-15.)

Moore has "a shell constituted by a ring of sheet metal which is severed or split at one point" (P. 2, line 95), which is shown in Figs. 3, 4 and 5, and the outer periphery of this expansible shell is shaped to conform to that of the fabric which is placed upon it. The fabric, which Moore calls the "lining", is first woven into the desired shape conforming to the contour of the exterior of the expansible shell. (P. 2, lines 104-110). This fabric is illustrated in Fig. 7.

Moore's procedure is as follows:

1. The shell is contracted and is placed upon the expanding form illustrated in Figs. 1 and 2. (P. 2, line 125.)

20

2. "A piece of lining fabric or material having been made into the form of an endless ring by means of cement or sewing is then put on the shell." (P. 3, lines 2-5.)

3. The expanding mechanism is then actuated so as to expand the shell to the position shown in Fig. 3, the effect of which is "to stretch tightly the endless ring of lining material or fabric which has been applied to the said shell." (P. 2, lines 52-55.) This is done as the expander is rotated.

30

4. "While the parts continue to rotate, the cement is applied to the surface of the lining material or fabric and distributed uniformly by means of the roll 701, a suitable scraping knife being first applied, if desired." (P. 3, lines 86-90.) The cement distributing roll 701 is shown at the left in Fig. 1. This roll "has cylindrical portions for working upon the raised portions of the lining and a narrow raised portion for entering the depressions or angles". (P. 3, lines 93-96.)

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5. "If desired a non-extensible twine or yarn, or suitable wire may now be wound on the lining at each side of the middle portion." (P. 3, lines 96-99.) I understand by this that a twine or wire is to be placed around the tire in each crease between one of the wings 53 and the adjoining body part 531.

6. "Then the shell is removed and placed in a dry
10 room to partly dry the lining and thereby create the desired adhesive condition of the cement." (P. 3, lines 99-102.)

7. The specification then goes on to describe how the shell may be removed without contracting it. The specification further on says "The shell, which remains of the full size to which it was expanded, is now removed and taken away from the expansible former, and is set aside in the dry room until the rubber has set (*sic*) upon the
20 lining fabric or material". (P. 4, lines 7-12.)

8. The shell is then again applied to the expansible former. The specification says "The second time it is thus applied, which is after the cement has set as above noted, the wings of the lining are turned down onto the intermediate or middle portion to form the tread". (P. 4, lines 19-23.) By this I understand that the wings 53 are folded over upon the central body portion 531 (see Fig. 7) thus enclosing the embedded circumferential wires or
30 twines.

9. The rolls 47 and 48 shown in Fig. 1 are then "successively brought into action, smoothing and stretching the said wings into proper position and condition, the narrow roller working into the angles of the shell." (P. 4, lines 24-28.) 48, is the "narrow roller".

10. "Then the pneumatic roller 44 is brought into action to even up the lining and expel air from between the layers." (P. 4, lines 28-30.) This pneumatic roller 44
40 is shown in Fig. 1.

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11. "Another coating of cement is applied to the surface". (P. 4, lines 30 and 31.)

12. "and the shell is removed and again placed in the dry room to allow such coating to set". (P. 4, lines 32 and 33.)

13. "After the said coating has set, the shell is for the third time placed on the expansible former"

14. "for the purpose of having the rubber covering put 10 on, the latter being composed usually of sheet rubber" (P. 4, lines 34-38.)

15. "The pneumatic roller is used on the rubber covering to expel air and work the same into proper place and position". (P. 4, lines 38-40.)

Regarding the entire operation, the specification says

"It is not intended to remove the lining fabric or lining from the shell after having been applied 20 thereto, until the same is finished and thoroughly set". (P. 4, lines 40-44.)

It seems to me it suffices to recite what Moore does to show that the machine bears no resemblance in any respect to the machine of the patent in suit.

Q. 78. Have you read the Jeffery patent No. 607,245, Defendant's Exhibit M, and Mr. Waterman's testimony in connection therewith?

A. I have.

30

Q. 79. Will you say whether or not you agree with Mr. Waterman's conclusions?

A. I do not agree with Mr. Waterman's conclusions. Jeffery has a wheel the rim of which has two circumferential grooves, shown in Fig. 1 of the drawings. Jeffery says

"Upon this wheel I wrap a strap, or as many straps as may be desired, of fabric suitable for the tire-sheath, using, as is customary for such purpose, 40

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preferably a fabric which is saturated or charged to a suitable degree with rubber gum, rendering it adhesive, so that it adheres both to itself and to the wheel". (P. 1, lines 60-67.)

10 The action of his machine is to force the overlying portions of the fabric into the circumferential grooves by means of either the tool shown in Fig. 3 or the double tool shown in Fig. 2. Concerning this action, the specification says

20 "C is a wheel or roller having a dull knife-edged periphery adapting it to force the fabric into the groove when it is pressed against the outer surface of the fabric as the latter lies over the grooves while the wheel A revolves. The wheel C may be mounted in a handle to be held by the operator while pressing the wheel into the grooves, as in Fig. 3, or there may be two such wheels mounted on a common hub C' or roller provided with two beads, amounting to the same thing, carried in bearings D D, movable with respect to the forming-wheel A, so that both wheels may be simultaneously pressed up against the wheel A as the latter revolves and the fabric stretched into both grooves at once. There is some advantage in thus working on both grooves at the same time, be-
30 cause thereby the fabric is drawn both ways from the middle at once and is not stretched out of position, as it might be if one line only were operated at a time." (P. 2, lines 35-56.)

This bears no resemblance to the State mode of procedure.

Whatever may be the speed of rotation of Jeffery's wheel, the fabric maintains the same relation to it. There can be no throwing out of unattached skirts of the fabric,
40 as in the State machine.

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Jeffery's tools simply force the fabric into the grooves on the periphery of the wheel.

Jeffery's tools do not stretch the fabric radially against the sides of a ring-core, as do the spinning-rolls of the State patent.

Jeffery's patent application was filed Jan. 12, 1894, before automobiles were in use.

Q. 80. Have you read U. S. Letters Patent to Bayne & Subers, No. 847,041, Defendant's Exhibit N, and Mr. Waterman's testimony with respect thereto?

A. Yes.

Q. 81. Will you state whether or not you agree with Mr. Waterman's conclusions.

A. I do not.

This Bayne & Subers patent is for a method of tire manufacture which is totally different from that of the State patent in suit.

State starts with a flat woven fabric and shapes this flat fabric to the core.

Bayne and Subers do not use a fabric at all. The Bayne & Subers patent handles threads or cords and winds the same upon the ring-core.

For this purpose Bayne & Subers utilizes three sets of grooved wheels which are called "director wheels", over which the "prepared insulated threads" are designed to run, first with the director wheels 19 in the position shown in Fig. 4 of the drawings, namely at the base of the core. As shown in this figure, there are two threads *a* each of which is led to one of the grooved director wheels 19. As the core rotates these director wheels lay the two cores around its circumference. The support 28 for each director wheel is fed radially upward by the screw feed illustrated in Fig. 4. Accordingly, the director wheels lay the two cords in spiral paths on the sides of the core.

These two director wheels handle the two threads until they reach the position indicated at 21 in Fig. 4 of the

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drawings and as described at lines 35 to 40 of page 2 of the specification. The two threads are then transferred from the director wheels 19 to the two director wheels 36 respectively. These director wheels 36 are referred to as "crown" director wheels, the wheels 19 being referred to as "side winding" director wheels. Concerning this transfer of the threads from the grooved wheels 19 to the grooved wheels 36, the specification says:

"The highest path of each side-winding director wheel and the lowest path of each crown director wheel come so closely together that the thread will almost run from one to the other. However, the thread is placed in position in the proper guide when the exact position of transfer is attained and the machine is not necessarily stopped to permit this transfer if run slowly." (P. 3, lines 12-20.)

Hence, either a slow rotation of the core is required or else it must be stopped to enable this transfer to be made.

The crown director wheels 36 then handle the two threads and as these crown wheels are arranged to move toward each other, they wind the two threads spirally upon the crown or tread zone of the core.

Also, two additional grooved director wheels 50 are employed, as shown in Fig. 6, for the purpose of laying the two additional threads spirally around the horizontally extending lateral extensions E (see Fig. 4) of the core or "frame" as it is called in the specification. This action of the two director wheels 50 is described at lines 39 to 51 of page 3 of the specification.

This is obviously a totally different mode of operation from that of the State patent in suit.

At the close of his answer to Q. 51, in discussing this Bayne & Subers patent, Mr. Waterman says

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"Indeed, there is no apparent reason why by simply rotating the machine in the *opposite* direction so that the wheels 19 would progress radially from without inwards (instead of in the reverse direction as when laying on the cords) the machine would not radially spin the fabric of a fabric tire smoothly down against the core."

10

That is to say, by acting upon a fabric instead of upon the cords; by rotating the core in the opposite direction to that which Bayne & Subers actually employ; by rotating the core fast enough to cause the fabric to fly out by centrifugal force; and by changing the contour of the grooved director wheels so as to have rounded convex edges, as in the State patent; Mr. Waterman with his present knowledge of the State machine can convert the Bayne & Subers machine into a State machine.

20

Q. 82. Have you read the three U. S. Letters Patent relating to metal spinning, Dewey 438,407, Defendant's Exhibit Q; Seymour 80,836, Defendant's Exhibit R; and Seymour, 376,167, Defendant's Exhibit S; and also Mr. Waterman's testimony in respect thereto?

A. Yes.

Q. 83. Will you say whether or not you agree with Mr. Waterman's conclusions.

A. I do not.

Mr. Waterman starts his answer to Q. 57 with a statement with which I agree. Referring to the spinning down of the fabric as carried out in the State patent and there referred to as "spinning", Mr. Waterman says

30

"It is of course an entirely different use of the word 'spinning' to that in which it is employed in textile work as referring to the forming of yarns".

Equally so, the use of the word "spinning" in the State patent is entirely different from its use when de- 40

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scribing the spinning of metals, or the spinning of boys' tops.

10 In all four instances, namely the spinning of yarn, the spinning of metal, the spinning of a top, or the spinning of the State patent, there is the common employment of high speed in the rotating spinning device. It is from this high speed that the word "spinning" in each instance is derived.

In metal spinning, the metal is made to flow. That is to say, the metal is displaced from one position to another. The metal cannot be changed greatly in shape except at several stages between which the metal has to be heated or else the metal has to be maintained hot.

20 There is nothing in metal spinning which bears any analogy whatsoever to the shaping of flat fabric to a curved surface by a stretching of the fabric so as to change the shape of the reticulations of the thread.

The Dewey patent 438,407, October 14, 1890, is a fair example of metal spinning: Dewey starts out by saying:

30 "Articles have been manufactured from sheet metal heretofore by successive and graduated pressing, depending on the depth of the article, and in some cases the metal was annealed after each pressing, as such pressing operation rapidly hardened it, which in turn caused the metal to tear and crack. Some metals, as German silver, are too brittle to be pressed to a great extent by this method. The process depends for its success upon the malleability of the metal; and it is the purpose of my invention to keep the metal annealed or in a softened condition during a greater part of if not the entire or complete formation of the article and to decrease the number of molds as well as the number of pressings usually required in forming or shaping the article, and also to save time in handling". (P. 1, 17-35.)

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As he here states, he is enabled to greatly change the shape of a sheet of metal because he maintains the metal in a softened condition by heat during the greater part of if not the entirely complete formation of the article, thereby decreasing the number of different moulds which have to be employed.

As shown in Fig. 2 of his drawings, the sheet of metal *a* is clamped between the rotary mold *C* and the face plate 10 *a'* of a revolving spindle. The metal thus clamped and rotated is maintained hot by the electrical heater indicated at *E*.

Accordingly, by thus maintaining the metal in a soft condition by heating it he is able to make it conform to the shape of the mold in one continuous operation, and thereby avoids the several stages theretofore employed with intermediate heat treatments.

Regarding this Dewey patent, Mr. Waterman says 20

"As the spinning tool moves over the core the metal is shaped to the latter but the centrifugal force holds the unspun portion standing straight out."

In spite of the fact that the metal is softened by the heat it is still stiff enough to stand out by itself. The centrifugal force present has no possible contribution to the effect. Perhaps Mr. Waterman imagines that the metal is in a semi-fluid condition, which it would have to be in order that the centrifugal force could cause it 30 to assume any different position from that due to its own inherent stiffness, and should this be the proper inference to be derived from the Dewey patent, the Dewey method is vitally distinct from that of the State, because State does not subject his fabric to any such temperature as would be required to render metal semi-fluid.

The two Seymour patents to which Mr. Waterman refers, show the prior sort of spinning to which the Dewey patent refers. That is to say, in these prior patents only 40

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a limited amount of shaping of the metal can be produced at any one stage.

Take the Seymour patent 80,836, Aug. 11, 1868, as an example. In this case, the metal is first shaped by the conical former shown in Fig. 6, concerning which the specification says

- 10 "Figure 6 is an elevation of a conical former, that may be used for giving shape to the article to be made in its first stages".

That is to say, by several stages the metal is shaped to fit the former of Fig. 6; finally, the shape is to be changed from that shown in Fig. 6 to that indicated by the former shown in Fig. 1. The conical shaped article is clamped between the rotating former of Fig. 1 and the rotatable chuck or "whirl" *h'*, and the final shape is then given by the tool *t*.

20 The remaining patent, that of Seymour 376,167, Jan. 10, 1888, says

- 30 "In this way air-chambers for pumps and other apparatus may be produced of thin steel or copper of great tensile strength and finely finished. The machine may also be employed for the purpose of contracting a number of cylindric shells one upon another, in order to make therefrom a piece of ordnance or cannon, each cylindric shell forming a mandrel upon which the next outer cylindric shell is tightly and permanently contracted". (P. 1, lines 22-32.)

As shown in Fig. 1, Seymour starts with a previously formed cylindrical shell D with a hemispherical end. The hemispherical end is clamped between the rotary mandrel B and the chuck C'. The cylindrical shell is
40 not shaped upon an interior core but has to be bent

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inwardly to the position indicated by the dotted lines in Fig. 1.

Regarding the operation, the specification says

"The cylinder or cylindric shell D may be brought to the form shown by full lines in Fig. 1, preparatory to operating upon it by this machine, by drawing with suitable dies and mandrels, and either in a heated or cold state, or in both a heated and cold state, the first drawing or folding operations being performed while the metal is heated, and the subsequent drawing operations being performed while the metal is in a cold state. The cylindric shell D may be operated upon by my improved machine either in a hot or cold state." (P. 3, lines 29-40.)

This adequately shows that a number of different stages of action are required to get the metal article into final shape, just as the subsequent Dewey patent says was the case prior to his invention.

This shaping of metal bears no resemblance to the forming of a flat fabric upon a ring-core, first by longitudinally stretching and then by radial stretching.

Q. 84. Have you read Mr. Waterman's testimony in connection with the speed mechanism of the machine of the State patent, and particularly with reference to the spiral gearing, etc. therein discussed?

A. Yes.

Q. 85. Will you say whether or not you agree with Mr. Waterman in his conclusions and make such comment thereon as you deem necessary.

A. I do not agree with Mr. Waterman.

The State patent makes the perfectly explicit statement that when the ring-core is moving slowly it has say six revolutions a minute, and that during the action of the spinning-rolls it operates at a much higher speed,

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say at two hundred seven turns a minute, or approximately thirty-five times as great (p. 2, lines 2 to 9).

It also illustrates and describes the "speed changing mechanism", and as I pointed out in my former deposition, in order to get the desired difference of speed any mechanic would know that all that it was necessary to do was to have the proper speed ratio between the driving
10 worm shafts and the spiral gears which are rotated therefrom, and I pointed out that this gear arrangement would be simply a matter of providing the gears with an appropriate number of teeth, which any mechanic would know how to supply.

The State patent is entirely adequate to direct any mechanic who wants to get the particular difference in speed ratio which State specifies.

Mr. Waterman appears to base his difficulty in understanding the State patent upon three points.
20

First, he points out the discrepancy in the use of the reference numerals at page 4, lines 2 and 4, and at lines 79 and 80 of the same page. Of course the scrivener has made a mistake in one of these two places, but it causes no confusion to anyone trying intelligently to read the patent. Mr. Waterman himself has pointed out that if lines 79 and 80 are followed an impossible organization is produced. If lines 2 and 4 are correct a rational organization is disclosed competent to secure the specified
30 speed ratio.

Mr. Waterman also calls attention to the circumstance that in the sections of the two gears 75 and 83 shown in Fig. 3, each shows a single tooth in elevation; whereas, a true section of the gears shown in plan view in Fig. 1, would show at least one tooth in cross-section. It is evident that the draftsman has made a conventional showing in Fig. 3. No Patent Office drawings are expected to show gear teeth accurately. Even the tooth of
40 a plain spur gear is difficult to draw, as the working sur-

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face of the tooth is commonly the involute of a circle, which requires great care to draw. Spiral teeth are still more difficult to draw. As all the characteristics of gear teeth are old and well known, it is customary in Patent Office drawings to show them conventionally.

Finally, through the use of the words "just as" at line 127 of page 3, Mr. Waterman concludes that the two gears 75 and 83 are identical, and that the two worms for 10 driving them are identical, so that the speed difference would be simply that due to the different diameters of the sprocket wheels 79 and 82 (shown in Fig. 3), and thus Mr. Waterman reaches the conclusion that the speed ratio is approximately three to two instead of about thirty-five to one, which the patent specifically uses as an illustration.

On the basis of this interpretation of the words "just as", Mr. Waterman goes on elaborately to show how 20 absurd results would follow.

I will again quote the sentence containing the words "just as". It is as follows:

"The clutch member 72 is provided with a hub 74 rigidly secured to a spiral gear 75 adapted to be driven by a worm 76 mounted on the shaft 58 *just as* the corresponding clutch member 73 has a hub 84 secured to a spiral pinion 83 driven by a worm 82 from a spiral shaft 78." (P. 3, lines 123 to 129.) 30

The rational meaning of the language quoted is that the spiral gear 75 and worm 76 are "mounted" in the same way as the spiral pinion 83 and the worm 82. This is a true statement of the organization. There is no statement that the two spiral pinions 75 and 83 are identical or that the two worms 76 and 82 are identical. It is unmistakable that they are not to be identical because the two gears 75 and 83 are to be driven at different speeds in the ratio of 207 to 6, that is, about thirty-four and a 40

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half to one. There is nothing in this language to compel the resulting absurdities which Mr. Waterman brings about by assuming that the comparison involved in the words "just as" means identity in all respects. Anyone understanding what State is trying to do would know that this is not the case.

Any mechanic examining Fig. 4 would see that the
10 worm 76 therein shown drives the spiral gear 75 there shown at a much slower rate, in the ratio of about one to forty-five.

Then, looking at the relation between sprockets 79 and 82 in Fig. 3, he would see that the shaft 78 is driven more slowly than the shaft 58, in a ratio in the neighborhood of three to two,—more accurately nineteen to fourteen, and consequently when the shaft 58 is rotated forty-five times, the shaft 78 would rotate a trifle over thirty-three times at the 19 to 14 ratio. The patent does not
20 show a figure like Fig. 4 to indicate the worm which drives the spiral gear 83, but the mechanic knows that 83 must be driven so as to go 34.5 times as fast as the spiral gear 75. Now, as the shaft 78 rotates slightly over thirty-three times to one rotation of the slow spiral gear 75, the gear ratio between the worm on the shaft 78 and the high speed spiral gear 83 would have to be in the ratio of 34.5 to 33+ in order that the spiral gear 83 may rotate 34.5 times to 33+ rotations of the shaft 78, and
30 to one rotation of the spiral gear 75. It is merely necessary to select such a worm gear on the shaft 78 as will drive the spiral gear 83 at this ratio. If the worm has twenty-four teeth and the gear 83 has twenty-three teeth, the specified ratio will be obtained. The patent is adequate for a mechanic familiar with gearing to get the desired speed ratio.

Problems of gearing, for the purpose of getting different speeds, were so well known that it was not necessary for State to do more than indicate what he desires
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to get in order to enable the skilled mechanic to make the necessary calculations and provide the proper gears.

Q. 86. Does it make any difference on which sides the high and low speed mechanisms respectively are arranged?

A. It does not make any difference, so far as the operation is concerned, whether the high speed drive is nearer the core or farther from the core than the low speed drive. As a matter of convenient assemblage of the machine, it is doubtless more convenient to put the high speed drive away from the core, as in the Plaintiff's Exhibit No. 2.

Direct-examination closed.

NEW YORK, N. Y., August 3, 1920. 20

Present: Parties as before.

CROSS-EXAMINATION BY MR. SEWARD:

By consent of counsel, the following objections are made now with the same force as if made at the same time that the questions and answers objected to were asked and given.

Mr. Seward: I object to Qs. and As. 16 and 18, which refer to Plaintiff's Exhibit No. 2, and also 30 to Qs. and As. 38, 39 and 40, which also refer to the same exhibit, because plaintiff's counsel has declined to give a demonstration of the operation of the said exhibit for the purpose of testimony from my expert; and I give notice that I shall move the Court for an order requiring such a demonstration for the purpose of my testimony and shall object to any demonstration of the said exhibit at the time of final argument, or on appeal, either or both.

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10 Counsel for plaintiff states that the sole reason for not exhibiting the machine in operation was the inability to obtain the proper power in the temporary loft where it was located in Barclay Street. Numerous efforts were made to get the proper electric power, but it was impossible within the period under discussion. Then, due to the scarcity of available space in the City of New York, it was subsequently removed to a storage warehouse where it still stands. If the Court deems it desirable or necessary to have it operated, this will be attended to at some convenient time and place. The character of the machine renders it extremely difficult to handle and operate, its weight amounting to in the neighborhood of six tons. A considerable part of the difficulty involved at the temporary place of exhibition was whether or not the floors were strong enough to
20 sustain it. When it was finally set up, an additional and temporary platform had to be made for it so as to distribute the weight over a space greater than the normal floor space.

Mr. Seward: I am ready to attend with my expert at any reasonable time and place for the purpose of a demonstration of the said machine, be it in New York or any other city, said demonstration to be for the purpose of enabling my expert to give
30 testimony with respect thereto; and I again request such a demonstration.

Counsel for plaintiff states that it is not his intention to operate the machine either for the purpose of exhibition, and probably not even at the time the matter is presented to the Court. Defendant's counsel and expert have been afforded opportunity to witness the operation of the commercial Good-year machines, and the differences between those
40 machines and the first machine are trifling, and such

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differences have been already pointed out and expounded by plaintiff's expert. In addition, the tremendous inconvenience and expense involved in procuring quarters and the necessary power and means to place the machine in operation seem to be out of all proportion to the trifling advantage of satisfying the curiosity of defendant's expert in the matter.

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Mr. Seward: I object to the answer to Q. 50, which refers to the Stevens patent, No. 1,253,105, and to the offer in evidence of the said patent, on the ground that the same are immaterial, incompetent and irrelevant, and move to strike the same from the record.

x-Q. 87. When do you say automobiles were first known in this country?

A. Of course, it depends on whether is meant such knowledge as may be derived from publications or such knowledge as is derived from the commercial use of such machines, that is to say, the use of such machines in the regular course of commercial sale and their employment in the ordinary course of business or pleasure.

Historically, as a matter of publications available in the United States, the history of self-propelled vehicles for general road use, as distinguished from self-propelled vehicles running on tracks, goes back to about 1830.

30

Then, there were sporadic early instances of steam-propelled cars in the United States as early as 1895, or possibly a year or two earlier. From such steam cars were developed the early steam cars that were made by the Locomobile Company, the Stanley Brothers, and the White Company.

But it was certainly subsequent to 1895 that automobiles came into sufficient use in the United States as to be regarded as articles of commerce or trade, or as

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even an occasionally witnessed object on public roads. Indeed, in 1898 and 1899 cars operated by gasoline engines were more or less of a curiosity.

10 x-Q. 88. By the first sentence of your answer to Q. 4, do you mean to say that the patented art did not show apparatus for and methods of making tires similar to the closed mold and hand method which was used largely in making automobile tires, I mean the patented art as early as 1893?

A. I do not at present recall any patents or publications as early as 1893 illustrating such method of manufacture. Certainly there was no such patent in evidence which has been called to my attention.

x-Q. 89. The bicycle tires to which you refer were made of woven fabric body and rubber, were they not?

A. Yes.

20 x-Q. 90. Some of them were open on the inner periphery and had clincher edges?

A. Yes.

x-Q. 91. And these last named were designed to be used over an inner inflatable tube?

A. Yes.

x-Q. 92. And this form of bicycle tire was known in the early nineties, was it not?

A. I should say from recollection about the latter part of 1892.

30 x-Q. 93. Do you know what the shape of the reticulations of the fabric body in those bicycle tires was when then were inflated for use?

A. As a matter of observation or examination, I would say no. Any internal pressure, however, on a pneumatic tire having a woven fabric in its composition would have a tendency at least to cause some re-arrangement of the reticulations, producing some lozenge or diamond shapes.

40 x-Q. 94. Would the tendency be that these lozenges

Arthur S. Browne for Plaintiff—Cross.

at the outer part of the tire would have their long axes circumferentially disposed and those near the inner part of the tire radially?

A. Yes.

x-Q. 95. About how many times have you seen what you have described as the "hand operation" of making automobile tires?

A. I went on three occasions to the factory of the Goodyear Tire & Rubber Company, for the purpose of witnessing the hand operation. The first occasion was prior to the final hearing of the Firestone suit. The second time was prior to giving my first deposition in the present case. The third time was about a month ago. ¹⁰

x-Q. 96. Did you see tires made by hand on the third occasion?

A. Yes.

x-Q. 97. About how many tires have you seen made by this hand operation? ²⁰

A. It would be very difficult to state; a good many.

x-Q. 98. Have you seen over fifty?

A. I should say so; yes.

x-Q. 99. Watching the complete operation?

A. Yes.

x-Q. 100. On each occasion did you watch one man, I mean the same man, making tires by hand?

A. No, I saw several men on each occasion.

x-Q. 101. And you probably saw over fifteen tires completely made on each occasion? ³⁰

A. I should say so; yes.

x-Q. 102. Was this regular factory operation or were they made by hand for the purpose of demonstration to you?

A. Of course, I cannot tell whether it was regular factory operation or a demonstration. I should gather it was regular factory operation.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 103. Were these tires made of woven fabric or were they cord tires?

A. Both. Even the cord tires made by the Goodyear Company are made from a woven fabric.

x-Q. 104. In that fabric, the weft threads are very light, are they not, and spaced far apart simply for the purpose of holding the warp threads in alignment?

10 A. Yes.

x-Q. 105. The warp threads constitute the strength of the fabric?

A. Yes.

x-Q. 106. Now, can you say about what percentage of those tires you saw made by hand were cord and what percentage were ordinary woven canvas or duck?

20 A. I made no attempt to discriminate, so that it would be very difficult for me to estimate. I should say from recollection that I saw more of the cord tires made than the fabric tires.

x-Q. 107. For how long a time, about, did you observe this operation on each of the said visits?

A. Several hours all together, I should say.

x-Q. 108. You mean several hours on each occasion?

A. No; all together.

x-Q. 109. That is, several hours for the three occasions put together?

A. Yes.

30 x-Q. 110. Perhaps five or six hours?

A. No, I should not say that; perhaps two or three hours.

x-Q. 111. About how many times did you observe that the workman found that he had not sufficiently stretched the fabric to make the ends overlap, so that he stripped a portion of the fabric from the core and exerted a stronger pull until he had sufficiently stretched it so that the two ends would overlap?

40 A. Nearly every time.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 112. Did that occur in both the cord and ordinary woven fabric tires?

A. Yes.

x-Q. 113. In your answer to Q. 10, you mention the strong spiral springs of the machine of the State patent employed for pressing the spinning-rolls laterally towards the core. Do you consider those a characteristic feature of the State machine?

A. Yes.

10

x-Q. 114. In your answer to Q. 17, you refer to Figs. 12b, 12c and 9 of the State patent in suit. Do you intend to use the disclosure of Fig. 9 to correct the showings of Figs. 12b and 12c?

A. No, because I think that Figs. 12b and 12c do not require any correction.

x-Q. 115. Now, 12c shows the edges of the fabric turned out around the edges of the spinning-rolls. That is so, is it not?

20

A. Yes.

x-Q. 116. While Fig. 9 shows the edges of the fabric lying down against the tongue of the core, and not turned out around the edges of the spinning-rolls?

A. Yes.

x-Q. 117. Which of these figures do you say is correct, in that respect?

A. Both.

x-Q. 118. Why is that?

30

A. In some conditions the fabric may assume one position and in other conditions it may assume the other.

x-Q. 119. Would it assume the condition shown in Fig. 9 during the inward motion of the spinning-rolls or at the end of their inward motion; by "inward motion" I refer to the inward radial motion?

A. Yes, particularly if the fabric is a little stiff.

x-Q. 120. I believe it is a fact that you testified as an expert in the case of the Republic Rubber Company

40

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against Morgan & Wright, which case was in the Second Circuit, and involved the patent on the so-called "staggered tread" non-skid tire. Is that so?

A. I testified in a couple of suits on that patent. I have forgotten the name of the defendant in either case. I know one case was in the Second Circuit.

10 x-Q. 121. In your answer to Q. 26, you refer to the DeLaski & Thropp patent, No. 1,129,326, December 1, 1914, which has been put in evidence by plaintiff, and particularly to Figs. 1, 2, 3 and 14 thereof. With reference to Figs. 3 and 14, if the lines embodied in the shaft 115 had been dotted instead of solid where they cross the arm 108, the showing of Figs. 3 and 14 in this respect would be consistent with the showings of Figs. 1 and 2. Is that a fact?

A. Yes.

20 x-Q. 122. Do you say that there is a mistake in Figs. 12b and 12c, or either one, of the State patent in suit?

A. Yes, provided that it is to be supposed that these figures are anything more than diagrams to indicate the mode of operation. For example, Fig. 12c does not even show the spinning-rolls in contact with the fabric, being illustrated with a clear space between. If this figure is to be treated hypercritically, then this is a mistake.

30 Likewise, Fig. 12b does not show the fabric acted upon by the rolls as being pressed against the sides of the core, and if this figure is supposed to show actual operative conditions, there is a mistake in this respect.

x-Q. 123. Are there any other mistakes in Figs. 12b and 12c that you can point out?

A. As compared with the other figures, there may be others. I do not note any.

x-Q. 124. Fig. 12c does not show the fabric pressed against the core by the spinning-rolls, does it?

40 A. No. As I have said, it does not show the spinning-rolls even in contact with the fabric.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 125. You have not seen the defendant's machine operated since you gave your *prima facie* testimony, have you?

A. I have not seen the exhibit defendant's machine operated since I gave my former testimony. But since then I have been retained in a suit for the Lee Tire & Rubber Company and have been at their factory on two or three occasions, and I have noted quite a number of 10 the defendant's machines in use at that factory. I saw a dozen, or maybe sixteen.

x-Q. 126. Did you make any tests or examinations of the operation of those machines?

A. I saw them doing the regular work of the factory but made nothing in the way of tests.

x-Q. 127. Did you make detailed or particular examinations of their work?

A. Only enough to see that the machines were in substantial accordance with the exhibit defendant's machine 20 and that good tires were produced. Also, I noted some tires being made by hand there.

x-Q. 128. About how long did you watch hand-making?

A. Just casually in going by.

x-Q. 129. When you observed the operation of the exhibit defendant's machine, to which you have referred, did the initial stretching operation of the fabric, I mean the circumferential stretching, shape and form the fabric 30 to the outer curvature of the core? By the "outer curvature" I refer to the part which you have referred to as the "tread zone".

A. Yes.

x-Q. 130. Did this stretching and forming take place before any operation of the spinning-rolls?

A. Yes.

x-Q. 131. In the operation of the machine of the State patent, do you say that the spinning-rolls serve to remove 40

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wrinkles or puckers which existed in the fabric un-
attached to the core prior to the starting of the operation
of the spinning rolls?

A. No.

10 x-Q. 132. Then, do you say that after the fabric has
been stretched on the core circumferentially and the
tread roller employed, in the operation of the machine
of the State patent, there are no wrinkles or puckers in
the unapplied portions of the fabric?

A. No.

x-Q. 133. What is the fact?

20 A. The fact is that after the fabric has been stretched
circumferentially on the core and the tread roller has
been used, the skirts of the fabric are in a loose and baggy
condition. Indeed, I do not quarrel with the use of the
word "puckers" as indicating a condition of that kind.
30 The effect of the centrifugal force is to throw out the
fabric away from the core and to leave that portion of
the fabric, at least which the spinning-rolls act against,
in a smooth condition. Consequently, the circumstance
that ultimately the fabric is laid against the core with-
out wrinkles or puckers in it is due to the combined effect
of the centrifugal force and the action of the spinning-
rolls. There is no laying of the fabric in a wrinkled
condition against the sides of the core to produce wrinkles
40 requiring to be eliminated by the action of the spinning-
rolls upon the wrinkled surface of the fabric.

x-Q. 134. But, prior to the step of operating the
spinning-rolls in conjunction with the high speed rotation
of the core, there are puckers or corrugations in the
unattached portions of the fabric which do not exist after
the step of operating the spinning-rolls has been com-
pleted?

A. Yes.

40 x-Q. 135. I hand you a sketch and will ask you whether

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or not you say that well shows the limit of inward motion of the rolls 30 of the Mathern Belgian patent.

A. Yes, this sketch is an enlarged reproduction of what the drawing of the Mathern Belgian patent actually shows.

x-Q. 136. Well, does this sketch well show the limit of inward motion of the rolls 30?

10

A. Yes, as the same is disclosed in the Mathern Belgian patent.

x-Q. 137. Do you recognize this sketch made by plaintiff's witness, Mr. Ray, and referred to in yours and Mr. Ray's affidavits in the case of *Seiberling v. Firestone*, which you have mentioned?

A. Yes.

Mr. Seward: I offer this sketch in evidence, and ask that it be marked "Defendant's Exhibit Z".

20

x-Q. 138. Do I understand it is your contention that the tool of Figure 6 of the Mathern Belgian patent operates on the entire outer surface of the fabric on the core?

A. Yes.

x-Q. 139. From the center of the tread down to the end of the base of the fabric on both sides?

A. Yes.

x-Q. 140. But the Mathern specification says that the roll descends progressively on the side of the core, does it not? 30

A. Yes, from the top.

x-Q. 141. Where does it say that, "from the top"?

A. I have quoted the passage in my answer to Q. 56. I have there said that the slide is adjusted to bring the rollers to the level of the top of the core, and from this they act all the way down the sides of the core to the base.

x-Q. 142. And the passage to which you refer is the 40

Arthur S. Browne for Plaintiff—Cross.

one which is quoted in your answer to Q. 56? You do not now refer to any other passage of the patent?

A. No.

x-Q. 143. If only a single conical gear is used at each side of the oval or spherical rolls in the Mathern Belgian patent, will there be any puckering or plaiting of the edges of the fabric?

10 A. I should think it would be quite inefficient to produce any puckering or plaiting of the fabric. I have never seen such an organization used and so can only speak from general considerations.

x-Q. 144. But is it your opinion that a single such gear so placed on each side would perform any puckering or plaiting of the fabric?

A. I doubt very much if it would perform any puckering or plaiting of the fabric.

20 x-Q. 145. Then I understand you to say that the Mathern Belgian patent shows and describes the employment of only one such gear at each side?

A. Yes.

x-Q. 146. Do you say that the rolls 30 of the Mathern Belgian patent and the rolls 39 of the Mathern German patent perform the same function?

A. Yes.

30 x-Q. 147. In the operation of the machine of the State patent, does the circumferential stretching of the fabric on the core so as to cause it to conform about to what you have called the "tread zone" render it easier to remove the fullness, puckers, or corrugations in the edges of the fabric by the action of the spinning-rolls, than if a much less circumferential stretch were employed?

A. Yes.

x-Q. 148. And this circumferential stretch might be so increased as to leave very little work for the spinning-rolls to do?

40 A. Yes.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 149. Would you say that your answers to the last two questions would also apply to the Exhibit Defendant's Machine?

A. Yes.

x-Q. 150. Do you understand from the Mathern Belgian patent that the core is intended to be rotated at such a high speed as to cause the edges of the fabric to fly out under the influence of centrifugal force during the operation of the cradle 29 and rollers 38?

A. No.

x-Q. 151. Do you say that the machine of the State patent in suit operates according to what you have described as its characteristic mode of operation, whether or not the tread roller is employed?

A. Yes.

x-Q. 152. In your answer to Q. 66 you call attention to Mr. Waterman's assertion that the machine of the Mathern Belgian patent operated satisfactorily with the action of the rollers 30 omitted, the fabric being properly stretched on the core. And you mention that Mathern, however, did not omit the rolls 30 when he came to take out his German patent?

A. Yes.

x-Q. 153. It is also true that he did not omit them when he came to take out his Belgian patent?

A. Yes.

x-Q. 154. And it is also true that State did not omit his tread roll when he took out his patent in suit?

A. Yes.

x-Q. 155. Nor did he omit it when he took out his British patent which is in evidence?

A. He did not.

x-Q. 156. Do you find anything in the State patent in suit which refers to any radial stretching of the fabric?

A. I do not recall any place in the State patent which refers to radial stretching.

Arthur S. Browne for Plaintiff—Cross.

x-Q. 157. Why do you say, in your answer to Q. 70, that the ring-core of the Vincent machine is rotated slowly at all times by the illustrated worm drive?

A. There are several reasons that influenced my statement. In the first place, there is no change speed mechanism in the Vincent patent. The ring-core when rotated at all is rotated by the driving worm 6, shown in Fig. 1, which engages a worm wheel 7, shown best in Figs. 2 and 3, which is on the shaft carrying the ring-core. The illustrated worm gearing would impart a relatively slow movement to the ring-core. During this rotation of the ring-core the fabric is drawn from the supply over the stretching rolls 16 and 17, and this would imply a slow speed drive.

Also, during this same rotation of the ring-core the hammers 30 act. These hammers are moved away from the core and the fabric thereon by the cams shown in Fig. 2, and when the cams release these hammers they are thrown against the fabric on the core by springs and are thus brought into contact with the fabric until again lifted off by the cams. This involves a period of contact between the hammers and the fabric which would be inconsistent with any high speed of the ring-core.

And hence, for all of these reasons I assume that the ring-core rotates slowly.

x-Q. 158. The patent says that the hammers rise immediately after striking the canvas, does it not?

A. Yes. But this language is to be taken into consideration in connection with the operative conditions. With the illustrated mechanism, and particularly with the second or third layers of fabric, the hammers would remain in contact with the fabric under spring pressure for an appreciable length of time.

x-Q. 159. In your answer to Q. 71, you discuss the circumferential stretching of the fabric by the Vincent patent so as to be almost entirely conformed to the core,

Arthur S. Browne for Plaintiff—Cross.

and you refer to it as "excessive stretch". Do you mean to be understood that such a method is not employed on a large scale for the production of satisfactory commercial tires?

A. I do not know anything about the extent of use of such a method.

x-Q. 160. Do you know whether or not such a method is commercially used? 10

A. I do not.

x-Q. 161. Did you make any tests to ascertain whether or not there is radial stretching of the fabric in the operation of the Exhibit Defendant's Machine?

A. I shall have to refer you to my former deposition.

x-Q. 162. You mean your *prima facie* deposition in this case?

A. Yes. I have no independent recollection at the present time. 20

x-Q. 163. In the operation of the spinning-rolls in the machine of the State patent, is the fabric displaced from one position to another?

A. Yes.

x-Q. 164. In your answer to Q. 86 you say, referring to the machine of the State patent in suit, "It is doubtless more convenient to put the high speed drive away from the core". Why is it more convenient?

A. It is more convenient to get the driving connections to the source of power. 30

x-Q. 165. And this arrangement which you have referred to as existing in Plaintiff's Exhibit No. 2, is the opposite of the arrangement which you say exists in the State patent in suit?

A. Yes.

x-Q. 166. Do you say that the method of operation of the machine of the State patent in suit, which you have several times referred to as "State's mode of operation" 40

Arthur S. Browne for Plaintiff—Redirect.

or other words to that effect, is inherent in the machine of the State patent as described?

A. Yes.

x-Q. 167. Do you say that mode of operation is the necessary result of operating the machine of the State patent as described?

A. Yes.

10

Cross-examination closed.

REDIRECT-EXAMINATION BY MR. ROGERS:

Rd-Q. 168. You have referred to having seen, on your several visits to the Goodyear factory, a number of tires, perhaps forty or fifty, made by hand. Will you kindly state more fully how many men were engaged in the work that you witnessed.

20

A. I should say there must have been fifteen or twenty men that I saw doing work.

Rd-Q. 169. You have stated you have not been able to find any reference in the State specification to the words "radial stretching". What is the language of the State patent in that respect?

30

A. It speaks of shaping the skirts of the fabric to the sides of the core, and as I just stated in answer to the last two cross-questions, the radial stretching is inherent in the action of the spinning-rolls moving spirally inward while the core is rotating rapidly. Accordingly, radial stretch is done by the machine.

Rd-Q. 170. What do you mean when you say that in the State mode of operation the fabric is "displaced"?

40

A. At the beginning of the action of the spinning-rolls the skirts are standing outwardly away from the core, and by the time the spinning-rolls get through the skirts have a different place, then hugging the sides of the core. Also, each reticulation of the fabric is differently placed at the conclusion of the action from the

Arthur S. Browne for Plaintiff—Recross.

position which it occupied at the beginning. The squares are converted into diamonds or lozenges and thus the threads are "displaced" as compared with the original condition of the fabric.

Rd-Q. 171. What comment, if any, have you to make in connection with Defendant's Exhibit Z, drawing showing limit of inward motion of rolls 30?

A. While this drawing does reproduce, on an enlarged scale, accurately the arrangement of the rolls 30 and 10 their actuating crank shaft 33, it also shows that the crank shaft cannot keep on rotating around and around. The specific illustration indicates the guide bar as at its extreme movement toward the core. Accordingly, the crank shaft would have to be oscillated back and forth and limited in both directions by the illustrated guide slots. I therefore think this would involve a relatively slow action as compared with what would be the case if the crank shaft should be continuously rotated.

I note in this connection that in Defendant's Exhibit 20 H, machine of Mathern Belgian patent, the defendant has so interpreted the Mathern drawings as to avoid any restriction to the back-and-forth movement of the sliding bar which carries the rolls 30, so that the crank shaft may be rotated continuously around and around.

Also, Defendant's Exhibit Z indicates, by dotted lines, the position of the bead.

Redirect-examination closed.

30

RECROSS-EXAMINATION BY MR. SEWARD:

Rx-Q. 172. You still recollect, do you not, that this Defendant's Exhibit Z is a reproduction of the sketch to which you referred with approval in your affidavit in the *Seiberling v. Firestone* case, which sketch was produced on behalf of Seiberling?

A. Yes.

Rx-Q. 173. With reference to the making of tires by 40

Arthur S. Browne for Plaintiff—Recross.

hand at the Goodyear plant, did you watch fifteen men simultaneously, or one at a time?

A. Both. That is to say, I could first look at one man and then cast my eye along and see what the others were doing.

Rx-Q. 174. About how much floor space did the fifteen men and their apparatus occupy?

10 A. Quite a good deal of floor space. My recollection is that the men were working in two rows, and I stood between so that I could first look at one side and then at the other.

Rx-Q. 175. And were they about eight or ten feet apart?

A. About that; yes.

Rx-Q. 176. Did you have any difficulty in watching them simultaneously?

20 A. No, I walked along between the different men and saw what each was doing.

Rx-Q. 177. Referring to Defendant's Exhibit Z, whether the shaft 33 is rotated or oscillated, a reciprocatory movement is imparted to the roller 30; is that a fact?

A. Yes.

Recross-examination closed.

Deposition closed.

Signature waived.

30

Counsel for plaintiff introduces in evidence a certified copy of the file-wrapper and contents in connection with the application of U. S. Letters Patent of Thropp & De Laski, No. 1,119,326, dated December 1, 1914, marked "Plaintiff's Exhibit No. 15—Thropp & De Laski File Wrapper".

40 Mr. Seward: I object to the reception in evidence of this document on the ground that the same is immaterial, incompetent and irrelevant.

Alexandre G. H. Spiers for Plaintiff—Direct.

NEW YORK, N. Y., July 29, 1920.

Present: Parties as before.

Whereupon ALEXANDRE G. H. SPIERS, a witness called on behalf of the plaintiff, being first duly sworn, in answer to interrogatories propounded to him by Mr. Rogers, deposes and says as follows:

Q. 1. What is your name?

10

A. Alexandre Guy Holden Spiers.

Q. 2. What is your occupation?

A. Professor at Columbia University, in charge of the French and Spanish in the college.

Q. 3. As I understand it, you are descended from a family that has been for some time engaged in the study and teaching of the French language?

A. My grandfather was a professor of English in France. My father and my uncle are still teachers of the French language, one in London and one here. My grandfather has gotten out a French dictionary, and my father a good many French texts.

Q. 4. What is the name of the dictionary that you say your grandfather edited?

A. It was a French-English dictionary and was originally known as, and is still published as Spiers' French-English Dictionary, and another version of it was published in this country as Spiers & Surenne's Dictionary.

Q. 5. I desire to call your attention to the French word "déplisser" and its derivatives "déplissage" and "déplissement", and ask you to say what you regard as the correct translation of these words.

A. Well, in general I should say it meant *to unwrinkle*. It might mean, in a more particular case, *to unplait*. The derivatives you mention have a corresponding meaning of *unwrinkling* or *unplaiting*.

Alexandre G. H. Spiers for Plaintiff—Direct.

Q. 6. What is the derivation of the French verb "déplisser"?

A. It is derived from "plis", the plural of the word "pli", and it is translated *unplaiting*, the idea being that folds are pressed tight, creating a sharp edge.

Q. 7. That is to say, the word "pli" implies the idea of a tight or sharp crease-like edge?

10 A. Yes; it is the usual translation for *crease*. It also means, of course, a folding over tight of anything which makes a sharp edge, for instance, as an envelope, which is often called a *pli*.

Q. 8. Would you say that the French words "déplissement" or "déplissage" could be properly translated by the English word *unpuckering*, or *removing puckers*, or *eliminating puckers*, and the like?

A. Not if the French word is used at all strictly.

20 Q. 9. What are the French words, respectively, for the noun "pucker" and verb "pucker"?

A. The noun pucker is sometimes "poche", that is very often an unintentional pucker of cloth. The verb is translated quite loosely by "froncer", but more particularly by "faire goder". That is the most accurate word for it.

Q. 10. If I am correct, the distinction you draw is that the word "pli" and its derivatives imply the formation of a crease or sharp edge of a certain degree of per-
30 manency, which crease or sharp edge is not necessarily involved in the French equivalent of *pucker*. Is that correct?

A. Yes, that is correct. "Goder" is to form a curved surface, that is, a convex or rounded effect, as distinguished from the sharp edge or crease involved in the derivatives of "pli".

Q. 11. Would you say that the French word "déplier" is the proper equivalent of the English word *to uncrinkle*?

40 A. "Déplier"? No. My explanation is this. I receive

Alexandre G. H. Spiers for Plaintiff—Cross.

a folded letter and unfold it. That word “unfold” would be the proper equivalent of the French word “déplier”.

Q. 12. When you use the word “déplier” in this sense, as for instance when you unfold a letter, does that unfolding eliminate the crease or sharp edge in the paper?

A. No, but it eliminates the making of the thing into two or three thicknesses. It eliminates the tight flattening involved in the word “pli”. 10

Q. 13. And the crease or sharp edged fold in the paper still remains?

A. It may remain. The word “pli” is the word for crease. The idea in the French word “pli” is one of tightness. To explain a little more specifically,—one of the principal authorities draws a distinction between “plier” and “ployer”, the former involving the idea of a fold or doubling of the thickness, and the latter involving a mere bending operation. For instance, you use the word “plier” in speaking of a piece of fabric which is folded over, and you use the word “ployer” when you merely bend an article, like the branch of a tree. The authority which I refer to is *Dictionnaire des Dictionnaires*. 20

Direct-examination closed.

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 14. Can you tell me about when the *Dictionnaire des Dictionnaires*, to which you refer, was published? 30

A. No, I cannot, but I can say that this dictionary is the one which I have heard mentioned in my University courses on the other side.

x-Q. 15. Is that authority available in this city?

A. Yes, in the Columbia library.

x-Q. 16. Can you name any dictionary which gives the meaning of the verb “déplisser” as being to *uncrenkle*?

A. That is a very hard question because I am going 40

Alexandre G. H. Spiers for Plaintiff—Cross.

from my use of these things. I cannot say without consulting these dictionaries, but I believe that I can find it.

x-Q. 17. Then, as I understand it, you cannot give the name here and now of a single dictionary which you know translates the verb "déplisser" as to unwrinkle? Is that correct?

A. Yes.

10 x-Q. 18. Is John Bellows' Dictionary a good authority on the translation of French and English?

A. It's a good working dictionary, not over-accurate.

x-Q. 19. I refer to the one in which it is stated that the author was assisted by Auguste Marrot. Is that the one you have in mind?

A. The one that I know was a small pocket edition. There may have been later editions.

x-Q. 20. How about the dictionary of Ferdinand E. A. Gase?

20 A. That is no good.

x-Q. 21. Why do you say it is no good?

A. Because, from the use in my classes made of it by students, I have had to think of dictionaries, and I have told them that it is not to be trusted as an accurate one. It is a thing which may give synonyms to fit this or that phrase.

x-Q. 22. How about the International French-English Dictionary, by Paul Passy?

30 A. That is a better dictionary.

x-Q. 23. Is that a good authority?

A. Yes, a reasonably good authority.

x-Q. 24. How about Spiers & Surenne's French-English Pronouncing Dictionary?

A. I do not know Spiers & Surenne. I have not worked with it.

x-Q. How about Spiers Dictionary?

40 A. It is based upon the *Bibliothèque* and other dictionaries. It is one of the most accurate, although it does

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not go out of its way to give synonyms and approximate meanings very much.

x-Q. 26. Is that the dictionary referred to as the dictionary of Alexander Spiers, Professor of English at the National College of Bonaparte, Paris, and the National School of Civil Engineers?

A. He was there at one time,—yes, I suppose so.

x-Q. 27. How about the dictionary of E. C. Clifton & A. Grimaux, revised by J. McLaughlin, called "*Nouveau Dictionnaire*—1914"? 10

A. I know nothing of it.

x-Q. 28. How about the Technological Dictionary, Vol. X, by Tolhausen?

A. If it is the one which I have consulted once in a while, it is too brief to be of any accurate use.

x-Q. 29. How about the dictionary of Deinhardt & Schlomann, a technical dictionary?

A. I don't know it. 20

x-Q. 30. How about the *Dictionnaire Universel des Synonymes de la langue Francaise*, by Guizot?

A. The mere fact that it is a dictionary of synonyms, seeing that no two words mean exactly the same thing, makes it inaccurate.

x-Q. 31. How about *Petit Larousse*?

A. Reasonably good for practical purposes.

x-Q. 32. You have criticised several of the authorities I have mentioned. Will you tell me what you consider to 30
be good authorities of dictionaries translating French into English?

A. I am sorry to say they are exceedingly few. The proper way to get at the meaning of a word is not by a bi-lingual dictionary. It is by the use of a big dictionary in one language to find out exactly what the words mean.

x-Q. 33. Can you name a good French-English dictionary?

A. As I say, I believe one of the most accurate—the 40

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one which I use to get words for my texts—is the one by my grandfather. I have used the International in preparing one of my texts, and my own experience and that of my collaborators was that while the International gave synonyms, as we say, words that might here and there fit, it did not stick close enough to the really fundamental meaning of the word.

10 x-Q. 34. Then the one your grandfather wrote, you say, is the only good one?

A. The closest one.

x-Q. 35. Is it the only one you recommend?

A. For students who come to me, it is the only one. And the form having the supplement by my uncle Victor.

x-Q. 36. Can you tell me about when that was published so that I can identify it.

A. My memory of that supplement would be that it
20 came out about 1900, I should think.

x-Q. 37. Then it would be the Alexandre Spiers Dictionary with Supplement by Victor Spiers?

A. Yes.

x-Q. 38. Is that available in this city?

A. They have it in a few bookstores here. The plates were destroyed when the Germans came into one of the towns in the west. But Simkin-Marshall of London used to get it out and they probably still have some. I can get
30 it through my uncle.

x-Q. 39. In your affidavit that you made in the case of Frank A. Seiberling against The Firestone Tire & Rubber Company, you said, "My grandfather was the author of the original Spiers French-English Dictionary, published abroad and subsequently published in this country as the Spiers & Surene Dictionary". Is that statement correct?

A. So far as I know.

40 x-Q. 40. Do you know it to be correct?

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A. What I know is this. That there were two lawsuits when Surenné came out and it was found impossible to prosecute. The copyright laws have recently been changed and I suppose we still have it, because Appleton wanted to know whether I had new words to put in an edition of the Spiers & Surenné Dictionary, and I referred him to my uncle who has more material than I have. 10

x-Q. 41. Then, to the best of your knowledge and belief, this Spiers & Surenné Dictionary is substantially a reprint of the Spiers?

A. It is.

x-Q. 42. What does the French word "rider" mean?

A. "Rider" is a word, which in its most usual use, has been narrowed down to one application. In other uses, it is nearer to the original meaning. The original meaning is somewhat like our English "ride", perhaps connected with it when you say your collar rides on your neck. It means a distortion in the sense of folding. As a consequence, because it has come to be applied most generally to the phraseology when speaking of the forehead, it can mean *to wrinkle*. 20

x-Q. 43. Does "pli" mean a corrugation?

A. I don't know what a corrugation is.

x-Q. 44. You do not have a definite, fixed meaning of the English word corrugation in mind? 30

A. I do, but I wish to define that meaning before answering your question.

x-Q. 45. What is that meaning you have?

A. My idea of a corrugation is the formation of a rise and fall sharply marked at the apex.

x-Q. 46. Does "pli" mean that either in the singular or plural form?

A. You mean to say "dépli"? Well, no; you would have to come to the derivative of the verb "plisser". 40

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Plisser can mean corrugate in this sense which I have given it.

x-Q. 47. Then, would “déplisser” mean to remove corrugations in the same sense you have given it?

A. Only in that sense in which I have given it.

x-Q. 48. Does “pli” mean a tuck?

A. If I know what a tuck means, it does not.

x-Q. 49. What do you understand a tuck to mean?

10 A. A pulling up of material so as to shorten it. A tuck, as I look at it, has no special characteristic of form. It may be loose. It usually is loose.

x-Q. 50. Then your understanding of “pli”, if I am correct, is that its meaning is limited to a fold having a sharp crease. Is that right? With the emphasis on the fact that the crease is sharp.

A. Yes, and the fold is tight.

x-Q. 51. It hasn't a broader meaning than that?

20 A. It might in occasional senses, but it hasn't really. As an example of this I take the meaning of “plier”, which is to put away a thing in compact form, as linen. “Plier le linge” means to take it when it has been ironed, double it on itself compactly so that it may be put away.

x-Q. 52. The purport of my question was to ask you whether or not the word “pli”, as you understand it, is limited to mean a fold including a sharp crease, and that it does not have a broader meaning.

30 A. It very rarely has a broader meaning. I cannot foresee a case.

x-Q. 53. What is the difference between the meaning of the words “plisser” and “plier”?

A. “Plisser”, formed on the plural, means the formation of a whole group or quantity of *plis*, with the further connotation in ordinary parlance that they are small.

x-Q. 54. That is, perhaps stating it another way, that the root, or whatever you call it, of “plisser” is “plis”, which is the plural of the noun; whereas, the root of 40 “plier” is “pli”, which is the singular of the noun?

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A. That explains half of my answer. The other half is that involving a number of folds. The connotation is that these folds are smaller, producing a surface sharply marked by edges or creases, as, for example, “une chemise plissé”, a plaited shirt.

x-Q. 55. What is the difference between a pucker and a plait?

A. My idea of the difference between a pucker and a 10 plait is that the plait is flat with a sharp edge. A pucker gives a bulge or convex curved surface.

x-Q. 56. And you understand the word pucker is limited to irregularity of a rounded nature?

A. Yes, I do.

x-Q. 57. May I ask just once more if you understand that the word “pli” means a fold like the fold made in letter paper when you fold it to put it in the envelope, and that it is limited to such a fold?

A. The fundamental idea in the word is that, includ- 20 ing, of course, the crease or the sharp edge. Careless or figurative speech might distort that fundamental connotation.

x-Q. 58. What might that careless or figurative speech use the word “pli” as meaning? What did you have in mind when you made that remark?

A. Simply inaccurate use of words which we find in all sorts of connections.

x-Q. 59. Can you give an illustration of this loose or 30 figurative use of the word “pli”?

A. I cannot, for the moment.

x-Q. 60. What is the French word for ruffle?

A. I am afraid I could not tell you what the French word is for ruffle.

Cross-examination closed.

Deposition closed.

Signature waived. 40

Frederick Ray for Plaintiff—Direct.

NEW YORK, N. Y., August 9, 1920.

Appearances: Same as before.

Whereupon FREDERICK RAY, a witness called on behalf of the plaintiff, having been already sworn, in answer to interrogatories propounded to him by Mr. Rogers, deposes and says, as follows:

10 Q. 1. You are the same Frederick Ray that has already given a deposition in this case?

A. I am.

Q. 2. Will you state whether or not you have made any comparative strength test as between tire carcasses made on Goodyear commercial machines and tire carcasses made by hand spinning?

A. Yes, I have conducted such tests.

20 Q. 3. Who made the experimental tires by the hand spinning method?

A. Mr. Arthur Mackey.

Q. 4. And who made the tires on the Goodyear commercial machine?

A. Mr. Albert Shaw.

Q. 5. Were these tires substantially the same, with the exception that one set was made by hand spinning and the other set on the Goodyear commercial machine?

30 By Mr. Seward: I object to any testimony as to the tests mentioned, on the ground that the same is immaterial, irrelevant and incompetent.

It is agreed by Counsel that this objection may stand without repetition.

A. Yes, they were the same, as near as it was possible for us to make them, in every respect.

Q. 6. How many plies were employed in each set of tires?

40 A. There were five plies.

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Q. 7. And was the material the same in both instances?

A. Yes.

Q. 8. How do you know that the material was the same in both instances?

A. I gave orders, of course, that it should be the same, and I saw all of the material that was used in both sets of tires; and, furthermore, I saw the thickness of the material measured, in some cases took the measurements 10 myself.

Q. 9. And were the beads the same in both sets?

A. Yes, the beads were the same standard beads such as the Goodyear Company used for these sized tires.

Q. 10. Were chafing strips supplied in both sets of tires?

A. Yes.

Q. 11. And were these chafing strips the same?

A. They were the same in all respects.

Q. 12. And how about the rubber cover, was that the same in both sets of tires?

A. Yes, the rubber cover was the same. The standard material such as would be used on these sized tires for finishing them as far as they were finished.

Q. 13. Did you see these tires, both sets of tires, actually made?

A. Yes, I was present and saw them made.

Q. 14. Mr. Mackey made the tires by hand spinning?

A. Yes, he did.

Q. 15. And Mr. Shaw made the other tires on the standard Goodyear commercial machine?

A. Yes, Mr. Shaw operated the machine.

Q. 16. Did you see the tires finished after the five plies had been laid in each set, respectively?

A. Yes, I saw them finished.

Q. 17. And that finishing operation was the same in both instances?

A. Yes, I saw them finished.

20

30

40

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Q. 18. And that finishing was the same in both instances?

A. Yes, it was the same.

Q. 19. And what do you know about the curing or vulcanizing of these tires, was that the same in both sets?

A. Yes, that was the same. I directed that they should
10 be both cured the same, and fully cured in the one step, so that the carcasses would be in the same condition as the normal tire is in use, as near as it was possible to do so.

Q. 20. Was a tread applied to the tires being considered?

A. No, no tread was applied.

Q. 21. Why did you omit the tread?

A. I was only interested in the strength of the carcass,
20 and the tread would have no bearing on this, and in fact might obscure the relative strengths of the two types of carcass.

Q. 22. Are you able to produce any records or charts relating to the curing of these respective sets of tires?

A. Yes, I produce herewith charts from the Bristol recording thermometers which are connected to the vulcanizing chambers in which these two sets of tires were vulcanized.

Q. 23. What, if you know, do these charts indicate?

30 A. These charts indicate the temperature of the steam within the vulcanizing chamber, and the length of time during which this temperature of steam was maintained.

Q. 24. Will you kindly mark in blue pencil on the two charts you are testifying about, the two indicating lines which respectively refer to the two sets of tires in question?

A. I am marking an M on the chart dated May 27, 1920, as to the best of my memory Mackey's tires were
40 vulcanized first, and there is no other way of telling

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these charts apart; and an S on the one dated May 28, 1920.

Q. 25. Why did you select the letter "S" in connection with the machine made tires?

A. I took it from Mr. Shaw's initials.

Q. 26. Do I understand that the "M" on the other chart is Mr. Mackey's initial?

A. Yes, that is why I selected the M.

Q. 27. There are other cures also indicated on these two charts, are there not? Do these other cures relate at all to the two sets of tires we are discussing? 10

A. No, they relate to the standard work which was going on before and after these particular tires were cured.

Plaintiff's counsel introduces in evidence the two charts referred to, marked "Plaintiff's Exhibit No. 17, Vulcanizing Charts". 20

By Mr. Seward: I object to the reception of this proffered exhibit, on the ground that the same is immaterial, irrelevant and incompetent; and it is agreed that this objection may stand without repetition as against all other exhibits which may be offered referring to all tests made by the witness.

Q. 28. How are these respective sets of tires marked?

A. The tires which were made by Mr. Mackey by hand spinning, are marked with M in red rubber and with, 30
following the M, numerals 1 to 10, each tire carrying its number. The tires made by Mr. Shaw are marked with a capital S in red rubber, followed by the numerals 1 to 12. These markings were placed on the tire by Mr. Shaw as soon as they were finished, and were observed by me at that time in all cases. When vulcanized, the markings remained permanently in red.

Plaintiff's counsel introduces the two sets of tires in evidence, marked, respectively, "Plaintiff's Ex-40

Frederick Ray for Plaintiff—Direct.

hibit No. 18, Hand Spun Tires" and "Plaintiff's Exhibit No. 19, Machine Made Tires".

Deposition of witness suspended to permit the depositions of Messrs. Bedell and Rowles.

Whereupon FREDERICK RAY resumed the stand, and in answer to further interrogatories propounded to him 10 by Mr. Rogers, deposes and says, as follows:

Q. 29. Did you observe closely Mr. Mackey when he was making the tires embodied in Plaintiff's Exhibit No. 18?

A. Yes, I observed him carefully all the time.

Q. 30. Was his work competent and successful?

By Mr. Seward: Objected to as incompetent and calling for a conclusion.

20 A. Yes. In my mind Mr. Mackey was a very skilful tire maker, and the work which he did on these tires was very carefully and perfectly done.

Q. 31. What is your recollection as to whether or not Mr. Mackey finished the tires, put on the rubber elements, the beads, etc.?

A. Mr. Mackey stretched all the fabric onto the cores; did all the spinning down of the fabric on the sides of the cores; and applied most of the beads. He also, of course, spun the fabric lying outside of the beads, down 30 to the beads. This was all done in accordance with the Goodyear standard practice, which does not permit of the fabric being spun over the beads in the first operation of the carcass making, but leaves this to a second operation of finishing by hand, and this same practice was followed in making these tires. Mr. Mackey finished a number of them, that is, he finished the laying of the fabric about the beads, but in order to assist him and save time the others were finished by a regular employee of the Goodyear Com-
40 pany who does this work, whose name I do not know.

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This man also applied the rubber covering and the chafing strip about the bead.

Q. 32. You say that Mr. Shaw made the tires embodied in Plaintiff's Exhibit No. 19 on the State machine. Was this machine the customary Goodyear commercial machine?

By Mr. Seward: Objected to as incompetent and 10 indefinite.

A. Yes. These tires made by Mr. Shaw were made on one of the Goodyear machines which I have seen from time to time in regular production,—in fact I have always so observed it, except in this particular case. This machine was one of the dozen or two of the older model State machines which have been in operation for many years.

Q. 33. Referring again to these tires of Plaintiff's Exhibit No. 19, were they made in the usual manner 20 which you say you have observed from time to time?

A. Yes. These tires were made just the same as all that I observed of this type.

Q. 34. Was there anything unusual or extraordinary in their manufacture?

A. Nothing whatever that I know of.

Q. 35. I understand that it was your purpose to have the two sets of tires, hand-spun and machine-made respectively, made exactly alike except in so far as the different 30 mode of stitching the fabric on the sides of the core is concerned, is that correct?

A. Yes. That was my intention, and I used every effort to see that it was carried out and believe that it was so carried out.

Q. 36. Were these machine-made tires finished in the same way as the hand-spun tires?

A. Yes. They were finished in the same manner, by the regular finishers who are located in this room close 40

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to these tire machines, and who do the regular finishing upon the standard product.

Q. 37. How about the bead application?

A. The bead application on these tires made in the machine of course is done in the machine itself, that is, the man operating the machine applies the bead. But the fabric, of course, is placed around the bead by the hand
10 finishers.

Q. 38. In the same way as in the hand-spun tires of Plaintiff's Exhibit No. 18?

A. In exactly the same way.

Q. 39. And what about the application of the rubber cover or cushion?

A. That was applied in exactly the same way; Good-year standard practice all the way through, as I have observed.

20 Q. 40. You said in a previous answer that you subjected these tires to a comparative test to determine their respective strength. Generally speaking, what was the nature of that test?

A. The tires were subjected to an internal hydraulic pressure until each one burst, the pressure required to burst being observed and recorded.

Q. 41. Why was it you selected this hydraulic bursting test to indicate the bursting strength of the tires?

A. It seemed to me to be the only test which would
30 give a fair comparison of the relative strengths of the two tires; and furthermore it subjected the tires to stresses of a similar nature to those which they have to withstand in service.

Q. 42. Do you regard the so-called tire tests obtained from employing them on automobiles, as certain in their results?

A. No, I do not for this purpose, because too many different conditions, uncontrollable conditions, come
40 into effect in the road test, and it seems to me that it

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would be quite impossible to arrive at any proper comparative results by such methods.

Q. 43. Do you know whether or not this method of obtaining the comparative strength of tires by the application of internal hydraulic pressure, had ever been employed by the Goodyear Company before for the same purpose?

A. I had been informed that they used it extensively 10
in the past, and I know that recently they have been employing it in connection with the cord tires.

By Mr. Seward: I object to the part of the answer in which the witness states he was "informed" as to certain things, that is hearsay, and move to strike it out.

Q. 44. Do you regard the test employing the internal hydraulic pressure, as a searching one?

A. Yes. Every part of the tire is subjected to this 20
pressure, and any weakness existing is disclosed.

Q. 45. Generally speaking, and omitting the consideration of occasional instances, what is the principal way in which a tire is finally destroyed in use?

By Mr. Seward: Objected to as incompetent.

A. It has been my experience that when the tire becomes worn to a certain extent, it usually fails finally by bursting.

30

Q. 46. Does this application of internal pressure subject the tires to the character of forces that the carcass is generally intended to withstand?

A. Yes. The stresses set up are the same to all practical purposes.

Q. 47. Will you now give us an idea or description of the character of the apparatus you employed in your tests, and how you used it?

A. I have here a sketch showing the cross-section of 40

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a tire mounted in the special bursting apparatus which we constructed for this purpose.

Q. 48. Will you describe it briefly?

10 A. This bursting apparatus was nothing more or less than an extra strong rim, made in halves, so as to support the tire in a manner similar to an ordinary rim. In addition to this there was an inner ring, which I have called a "bull ring" in the sketch, the purpose of this
ring being to clamp the beads of the tires against the sides of the rim and to prevent them from blowing out under the high pressure required to burst the tire. An inner tube was used inside the tire in the usual manner, and the hydraulic pressure was brought in to the inner tube through the usual valve stem, the valve, however, being removed.

20 Plaintiff's counsel introduces the sketch in evidence, marked "Plaintiff's Exhibit No. 20, Ray Holding Device".

Q. 49. Will you continue your description of the particular bursting apparatus you used in connection with the holding device you have just been discussing?

30 A. The hydraulic pressure was connected to the valve stem by means of a flexible hose, which in turn was connected to a source of hydraulic pressure,—the hydraulic pressure line of the factory in which existed a pressure of fifteen hundred pounds, approximately. In these connections there was located a needle valve to permit the water to flow to the tire, a six hundred pound test gage to indicate this pressure, and a waste connection controlled by a valve so that the pressure could be removed if desired. I present a sketch indicating the general arrangement of these features.

40 Plaintiff's counsel introduces sketch in evidence, marked "Plaintiff's Exhibit No. 21, Ray Bursting Apparatus".

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Q. 50. You say that the hydraulic pressure you employed in your tests was obtained from the regular hydraulic pressure device already in existence at the Good-year factory. Are you able to say for what purpose that hydraulic pressure was employed prior to your test?

A. I know for one thing that it is used in connection with the vulcanizers to operate the hydraulic ram which holds the molds together. I have seen other apparatus in the factory which is also operated hydraulically 10 but cannot state exactly now what it was.

Q. 51. Do you know whether or not this hydraulic pressure has been employed for the purpose of testing hose, or tires, or other articles of that kind, prior to your test?

A. I know that it had so been used. In fact we conducted these tests in a laboratory or a room which was specially set aside for this class of work and was in use 20 before we conducted these experiments.

Q. 52. Do I understand that in conducting your tests you burst all of the tires comprised in Plaintiff's Exhibits Nos. 18 and 19, respectively?

A. Yes, we burst all these tires.

Q. 53. State briefly in what way you allowed the hydraulic pressure to be imparted to the inside of the respective tires and whether or not you recorded the bursting pressure of each tire.

A. After mounting the tire upon the holding rim and 30 bolting same together as tightly as possible, we subjected it to an air pressure of approximately eighty pounds to inflate the inner tube and get it to fit smoothly inside the tire. We then allowed this pressure to escape by removing the air hose, the valve already having been removed, until the air within the tire was of ordinary atmospheric pressure. The hydraulic hose was then connected to the valve stem and we allowed the water to flow into the tire until it was practically full of water, with the exception of the 40

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air, up to a pressure of one or two hundred pounds; we then slowed down the flow until it flowed in very slowly, and observed the increase in pressure shown on the test gage; by the use of the needle valve we were enabled to keep the flow of water into the tire down to such a small rate that the pointer of the pressure gage moved extremely slowly. We followed this in its movements very carefully, 10 reading off the pounds as it increased, until the tire burst; we then made a record of the maximum pressure shown by the gage at the time of bursting.

Q. 54. Next state the respective pressures at which the hand-made tires comprised in Plaintiff's Exhibit No. 18 burst, respectively.

A. The hand-made tires, marked, respectively, M¹ and M², etc., to M¹⁰, burst at the following pressures:

20	M ¹	395,	M ⁶	408,
	M ²	393,	M ⁷	358,
	M ³	393,	M ⁸	396,
	M ⁴	392,	M ⁹	391,
	M ⁵	364,	M ¹⁰	391,

the average of these ten amounts being 388.1.

Q. 55. Next state the respective pressures at which the machine-made tires comprised in Plaintiff's Exhibit No. 19 burst, respectively.

A. The machine-made tires marked, respectively, S¹, 30 S² to S¹² burst at the following pressures:

S ¹	480,	S ⁷	442,
S ²	450,	S ⁸	408,
S ³	421,	S ⁹	409,
S ⁴	405,	S ¹⁰	449,
S ⁵	424,	S ¹¹	462,
S ⁶	425,	S ¹²	454,

the average of these twelve amounts being 435.75.

40 Q. 56. Did you have any difficulty whatever in holding

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the beads in connection with the bursting of the hand-made tires?

A. No, we had no difficulty in connection with bursting these tires.

Q. 57. Did you have any difficulty whatever in holding the beads in connection with the bursting of the machine-made tires?

A. Yes. We had considerable difficulty in holding the 10 beads. These beads alone will carry a pressure in the tire of approximately 350 to 360 pounds, and, as the hand-made tires require only about 30 pounds or so more to burst them, we had no difficulty in clamping the test rims tight enough together to hold this additional amount. In the case of the machine-made tires, however, the pressure required to burst being so much greater, it required a great deal of care on our part to hold these beads; and in the case of tire S², the bead blew out before the tire burst, notwithstanding our care in trying to hold it. I might add 20 that it required a great deal of preliminary experimenting on our part to be able to hold these machine-made tires.

Q. 58. What is the approximate difference in percentage between these respective bursting averages in favor of the machine-made tire?

A. 12.3 per cent. That is, it required 12.3 per cent. more pressure on the average to burst the machine-made 30 tires than it required to burst the hand-made tires.

Q. 59. What is the normal service pressure employed in connection with 34-4 tires such as are comprised in Plaintiff's Exhibits Nos. 18 and 19?

A. Approximately 75 pounds.

Q. 60. Approaching the subject from this standpoint, what would the respective safety margins be?

A. The machine-made tire would have a margin of safety of 15.2 percent. greater than the hand-made tire.

Q. 61. How do you arrive at this later figure? 40

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A. I have subtracted 75 pounds from each of the average bursting pressures and arrive at 360.75 pounds as the remainder in the case of the machine-made, and 313.1 pounds as the remainder in the case of the hand-made tires, the first figure being 15.2 percent greater than the latter.

10 Q. 62. Do you regard this percentage of safety margin in favor of the machine-made tire as arithmetically correct in indicating the greater longevity of the machine-made tire?

20 A. I consider that the life of the machine-made tire would be very much greater, as compared to the life of the hand-made tire, than indicated by these relative factors of safety. These factors of safety apply to the two tires when they are new; as depreciation goes on, due to the use of the tire, caused by the movements of the fabric due to use, the relative factor of safety of the machine-made tire becomes greater and greater as compared to the hand-made tire. The result of this is, in my opinion, that the life of the hand-made tire would be much less proportionately than is indicated by the relation between these two factors of safety from that point of view alone. Furthermore, since the fabric of the two types of tires is identically the same, as near as it is possible to make such fabric, and treated the same in its cure, the fact that the hand-made tires burst at a lower pressure than
30 the machine-made tires shows that at any given pressure, the same for both tires, the stresses in the hand-made tire are higher than those existing in the machine-made tire. In other words, under the standard inflation pressure, the stresses set up in the hand-made tires would be greater than those set up in the machine-made tires. As a result, the effect of the flexure or bending of the fabric, which is continually occurring at every revolution of the tire, would be more pronounced in the hand-made
40 tire in causing the fabric to depreciate or lose its strength

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than it would be in the machine-made tire. Thus, it is my opinion that after usage is begun the difference between the remaining factors of safety in the two tires would tend to become greater and greater very rapidly. Furthermore, one of the common causes of failure of tires is due to what is known as stone bruises, which are caused by the tire running over some comparatively small object like a stone, which makes a sharp indentation into the tire; this causes a high bending stress in the 10 fabric of the tire, the tensile stress being on the inside of the tire and the compressing stress on the outside at the middle portion of the tread. This tensile stress due to this bending action combines with the tensile stress due to the internal pressure and frequently results in a rupture beginning at the inner layer of fabric. The additional factor of safety which the machine-made tire has over the hand-made tire would be extremely important in preventing this rupture. 20

By Mr. Seward: I move to strike out the answer as incompetent and as secondary evidence, it being theoretical when practical evidence is obtainable.

Q. 63. Previous to the tests you have just described as between the tires of Plaintiff's Exhibit No. 18 and Plaintiff's Exhibit No. 19, had you made any similar tests?

A. Yes.

Q. 64. Will you state under what circumstances and for what purpose? 30

A. In connection with the various studies which I had made regarding the strength of tires, it seemed plain to me that the hand-made tire would not be as strong as the machine-made tire, and in order to determine whether or not my theory in this regard was correct, I had constructed a number of hand-made tires and a number of machine-made tires, and I burst these tires in an exactly similar manner to that already described, and found that my theory was verified. 40

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Q. 65. Was this preliminary test of yours initial, and caused you to proceed with the second main tests that you at first outlined?

A. Yes. It was for the object of determining whether it would be worth while or not to obtain a Diamond operator and make up tires just as they were previously constructed by the hand-spinning method and compare
10 them with tires made by machine.

Q. 66. Who made these preliminary tires for you?

A. Mr. Shaw made both the hand-made tires and the machine-made tires.

Q. 67. Would you state briefly and without going into extreme detail, the results you obtained in these preliminary tests?

A. I burst four machine-made tires at an average pressure of 429.5, and three hand-made tires at an average pressure of 383.6, the difference in percentage between
20 these two average pressures being substantially the same as I have given them in connection with the main test, which statement is true also in connection with the percentage in the difference of margin of safety which was similarly in the neighborhood of 15 per cent.

By Mr. Seward: I move to strike out this answer where it refers to the margin of safety, as incompetent and secondary evidence, it being theoretical
30 when practical evidence is obtainable. It is also understood that the objection made at the beginning of Mr. Ray's deposition applies to the tests referred to in the preceding answer.

Q. 68. In referring to this preliminary test, you have described the tires as "machine-made" and "hand-made" respectively. I assume you mean by this, tires made on the State machine, and tires made by the hand-spinning method. Is that correct?

40 A. Yes. The "machine-made" tires were made on

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the machine of Plaintiff's Exhibit No. 2, and the "hand-made" tires were spun by hand in the usual manner.

Q. 69. You stated that at different times and on different occasions you have seen the Goodyear commercial machines in practical operation. Will you say whether or not the quality of the work you saw performed thereon was good or bad?

A. As far as I have observed this work, and it has 10 been very frequent within the last three years, the quality of the work has been uniformly good. It is very seldom that any wrinkles are formed on the machine in spinning down the fabric.

Q. 70. Can you say whether or not in the observation of these commercial Goodyear machines, you have noted spinning the fabric around the beads by the spinning rolls?

A. Yes, I have observed this in the case of the ma- 20 chines used in making "Clincher" type of tires, in No. 2 plant.

Q. 71. How recently have you seen this practice of spinning around the beads with the spinning rolls?

A. About the middle of last winter or early this spring, the last time I was over at the No. 2 plant.

Q. 72. I direct your attention to the testimony of defendant's expert, as follows (*italics mine*):

"At the center of the shaft is an adjustable clutch 30 member 71 which is keyed to the shaft, but is capable of sliding thereon to engage with either one or the other of *two worm wheels or spiral gears as the specification calls them*, 75 and 83, which bear corresponding clutch members 72 and 73."

and again:

"The high speed was 120 R.P.M. instead of 207 and the gear mechanism which produced it occupied the position of the wheel and worm 75, 76 in Fig. 3 40

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but were not a wheel and worm but on the contrary were a pair of spiral gears having a different ratio of diameters and a speed ratio of 1 to 1 instead of 45 to 1."

and again :

10 "The patent further says that the other one of the two worm and gear combinations is 'just as' the first. Mr. Browne's sketch Defendant's Exhibit A, does not show such an arrangement but on the contrary presents a problem (not a solution) in spiral gearing."

and again :

20 "I may note that in the Goodyear machines which I saw, even though the speed requirement was much less exacting, namely only about 120 R.P.M., the high speed gear mechanism had been re-designed, the worm wheel being abandoned and a pair of spiral gears of approximately equal diameter substituted therefor."

and again :

30 "Thus the members corresponding to the worm 76 and worm wheel 75 are in Exhibit No. 2, a pair of spiral gears which furnish the high speed drive instead of the low speed drive as Mr. Browne interprets the State patent."

and again :

"The low speed shaft 78 is driven at a reduced rate from the high speed shaft instead of the reverse as in Mr. Browne's interpretation of the patent and for the high speed drive the worm and worm wheel have been replaced by a pair of spiral gears."

From these quotations, Defendant's expert would ap-
40 parently seek to establish a difference between worm

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gearing and spiral gearing. Will you say whether or not you recognize the distinction thus sought to be established?

By Mr. Seward: Objected to as not rebuttal evidence; this having been gone into by plaintiff on *prima facie*.

A. No, I do not.

Q. 73. Will you give your reasons for your answer, basing them on your experience as a machine designer and a mechanical engineer? 10

By Mr. Seward: Same objection; and it is agreed this may stand to all testimony on this point without repetition.

A. I have long been familiar, personally, with spiral gearing, and have been familiar with the usages of the word "spiral" gearing and "worm" gearing, and know in the first place that there is just one type of gear involved here, namely, a spiral gear. Usage differs, however, among different people in describing these gears, some people calling a particular gear a "worm" gear and others calling it a "spiral" gear. From an exact technical standpoint, however, there is only one type involved, which is in fact, properly speaking, a helical gear, the word spiral being inaccurately used but nevertheless commonly used by many people. 20
30

Q. 74. How far back does your experience go in this subject-matter?

A. I made a study of the subject of gearing when attending Stamford University, between 1897 and 1899, and did the usual designing on such gears included in a course in machine designing, and from '99 on I had occasion to design various gears of these types for actual use, and did so design many such gears.

Q. 75. Do you recall any instances early in this cen- 40

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tury of the use of such gearing as is now under discussion?

A. I remember, about the year 1902, seeing a good many gasoline engines in which such gearing is used between the crank shaft and the shaft used for lifting the valves and operating the spark. These engines which I have in mind particularly, were made by the Otto Gas Engine Company, of Philadelphia, the concern which I
10 worked for at that time being agents for them, and all of these engines used what was ordinarily called spiral gears for the speed reduction. Other gasoline engines also used them, about the same period. In fact, they were quite common, although the particular names of the other engines I cannot recollect at the moment. I also, personally, had occasion to design a small pump which was driven by similar gears; that was about the same period, in fact I was employed at that time by the same firm.

20 Q. 76. I will next ask you to look at the State patent in suit, and state whether or not the terms "spiral" and "worm" are used in any discriminating or distinguishing sense.

A. I notice, beginning at the bottom of page 3, line 123, the specification states:

30 "The clutch member 72 is provided with a hub 74 rigidly secured to a *spiral gear* 75 adapted to be driven by means of a *worm* 76 mounted on the shaft 58 just as the corresponding clutch member 73 has a hub 84 secured to a *spiral pinion* 83 driven by a *worm* 82 on a shaft 78. The shaft 78 is driven from the shaft 58 by a chain and sprocket connection and the arrangement is such that the *spiral gear* 83 rotates much more rapidly than the *spiral gear* 75." (Italics mine.)

In this instance the word "spiral" is used four times and the word "worm" is used twice, describing the same gear
40 transmissions.

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Q. 77. Do you know whether or not there are any other references to "spiral" or "worm" in the patent?

A. I believe there are not, as far as I have been able to find.

Q. 78. Will you next state whether or not you are able to produce any authorities bearing on this same subject, namely, the interdependence and relation of "worm" and "spiral" gearing?

A. Yes, I can.

Q. 79. Are there many or few authorities that you have in mind? 10

A. Oh, there are numerous authorities.

Q. 80. Will you produce a few of them?

A. I find in the Standard Dictionary, near the bottom of the last column of page 1015, the following definition of spiral gear: "a gear having teeth arranged spirally or worm-fashion about its circumference".

I also refer to the American Machinist Gear Book, published in 1915 by the American Machinist. I refer particularly to pages 163 and 164, wherein the close relation of worm and spiral gearing is clearly indicated. 20

By consent of Defendant's counsel, without waiving the former objections, Plaintiff's counsel introduces in evidence photostatic copy of the two pages in evidence, marked "Plaintiff's Exhibit No. 22, Pages 163 and 164, American Machinist Gear Book".

I also refer to "The Theory of Machines", published 30 by McGraw-Hill Book Company, Inc., of New York, in 1917, and call particular attention to page 102 whereon appears an article entitled "Spiral or Screw Gearing", and under which appears a sub-heading "119. Worm Gearing"; and also to pages 106 and 107, and particularly therein the article beginning with a sub-heading "124. Screw Gearing".

Plaintiff's counsel similarly introduces in evidence photostatic copies of pages 102, 106 and 107, 40

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referred to by the witness, marked "Plaintiff's Exhibit No. 23, Pages 102, 106, 107, The Theory of Machines".

I also call attention to "Pure Mechanism" published by Henry Holt and Company, of New York, in 1914, and particularly to pages 261 and 262 thereof.

10 Plaintiff's counsel similarly introduces in evidence photostatic copies of the two pages referred to, marked "Plaintiff's Exhibit No. 24, pages 261 and 262, Pure Mechanism".

These are merely selections from a number of works at my disposal, and require no comment as all of them clearly indicate the close relation of the worm and spiral gearing and the interchangeability of the terms.

Adjournment until Tuesday morning, August 10, 1920.

20

NEW YORK, N. Y., August 10, 1920.

Met pursuant to adjournment.

Appearances: Same as before.

EXAMINATION OF MR. RAY CONTINUED:

Q. 81. I next direct your attention to the following passages from the deposition of Defendant's expert:

30 "The worm gear drive in typical form is one in which the worm rotates very much faster than the wheel; for example, in Fig. 4, the worm 76 rotates 46 times while the wheel 75 rotates once. If the wheel 83 is to be the high speed drive and to realize the speed set forth in the specification (207 R.P.M. for the shaft 90), then obviously the drive 83 must rotate $103\frac{1}{2}$ times while the shaft 78 rotates only 90 times. In other words, the worm gear mechanism must actually have an *increasing* ratio instead of the
40 usual greatly decreasing ratio."

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and also:

"I do not desire to be understood as saying that in machine illustration in general or where *usual* gear combinations are indicated, it is necessary that the drawings should show the specific details of the gearings as to the number of teeth and the like, but *in this instance a most unusual and extraordinary ratio seems to be required, a ratio so far as I know* 10 *which has never been attained by worm gearing. Such a problem is not one for the ordinary mechanic but is one which, if solvable at all, is only solvable by virtue of the skill and ingenuity of some gear specialist.*" (Italics mine.)

Will you state whether or not you regard the so-called "problem" as an unusual one or one difficult of solution?

A. No, I do not consider it either unusual or at all difficult of solution. If we are to consider the problem 20 on the basis of following the exact proportions shown in the patent drawing, then I find that it would require a pair of spiral or worm gears for the high speed drive, in which the angle of the threads or teeth of the pinion or driving gear would be 30° measured from the axis of the shaft. Consequently, the teeth of the driven gear would make an angle of 60° with the axis of the shaft. This would make the ratio of the number of teeth on the pinion to the number of teeth on the gear equal to 24 to 30 23. There is no difficulty whatsoever in cutting gears with the teeth which make these angles, and all the information necessary for both calculation and the cutting was well known prior to the year 1907.

Q. 82. Will you please state what data are ordinarily given machine shops for the manufacture of gears of this description?

A. It is usual to give the pitch diameters of the gears; the size of tooth to be used, expressed in either diametral 40

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pitch (which means the number of teeth per each inch in diameter), or in circular pitch (which means the distance occupied between similar points of two teeth upon the pitch circumference); the angles of the teeth; and the number of teeth upon each gear. Of course, from the dimension of the pitch diameter and the number of teeth, it would be possible to calculate the size of the teeth to
10 be used, or *vice versa*, from the pitch diameter and size of the teeth it is possible to calculate the number; but it is usual to give these four particulars, in addition to which, of course, the other dimensions such as the width of the face and bore, etc., are usually given, although they are not directly related to the problem.

Q. 83. Boiling down the answer to the last question, I understand that the four more important particulars necessary or desirable, and without the extended explanation you gave in the last answer, are: (1) pitch diameter,
20 (2) size of tooth, (3) angle of tooth, and (4) number of teeth, is that correct?

A. Yes.

Q. 84. And as a matter of fact, I understand that either the number of teeth or the size of tooth could be omitted when the pitch diameter is given, is that correct?

A. Yes.

Q. 85. Can you state what power is necessary to drive a machine like the State machine under discussion?
30

A. Not over 2 H. P. is required to drive one side of the State machine at 207 R.P.M.

Q. 86. I next direct your attention to the following statements appearing in the deposition of Defendant's expert:

"It is my opinion that no such arrangement could have been intended by the patentee and, so far as I know, it is *impracticable*. My opinion is that, assuming the same size blanks, as the drawings clearly
40

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show and the specification clearly implies, it would be *impracticable to get a ratio of speeds* of the wheel 83 to drive the shaft 78 better than about 5:1 if the gears are to be proportioned to transmit the same amount of power. Of course gears of a lower ratio could be made if higher speeds could be employed or if lower power and freedom from shock would suffice. The specification, however, fixes the speed at 207, and under the conditions named 10 *it is my opinion that a ratio of 1:5 is the best that could be obtained.* This would mean that the wheel 83 makes one revolution, while the shaft 78 makes 5 revolutions." (Italics mine.)

and again:

"The reason why the worm and wheel combination 82, 83 could *in my opinion not be constructed* for a ratio higher than about 1:5, is that *it would not seem possible to get on blanks of the relative size* 20 *of those indicated in the drawing* (and of the actual size that I would understand would be used in practice) *the required tooth dimensions to stand the shock strains.* Of course on paper it is easy enough to draw lines indicating a certain number of teeth and certain tooth angles which, if they could be built, would run at the required ratio if they had no work to do. Machines, however, are built to do work and to withstand certain shocks and strains, and gearing com- 30 binations, as well as all other parts, are designed by starting with the permissible dimensions and strains as a basis. The difficulty in designing a worm gear for such abnormal speed ratio as would here be required, is that *it is difficult or impossible to get a sufficient "root thickness" for the teeth,* and at the same time have such a number of teeth as is required for the speed ratio and to transmit the shocks at the actual required speeds." (Italics mine.) 40

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and again:

10 "I am satisfied, however, that for the speeds proposed the same horse power transmitted and with the general dimensions that I understand would apply *the ratio of 5:1, which I have given is not very far from the correct one, as the limit, and if forty-five teeth is to be regarded as fixed for the gear 83, then I would be still more positive in my statement that a better ratio could not be expected.*" (Italics mine.)

Would you state whether or not you regard these criticisms as sound, and whether or not such an arrangement as thus discussed is an impracticable one?

20 A. I do not agree with Defendant's expert's conclusions at all, and can see nothing whatever impracticable about the required construction. Defendant's expert states that a ratio of 5:1 is about the lowest that could be used to transmit the power. The facts are that a ratio of 5:1 would be about the highest ratio that should be selected if an efficient, durable set of gears were to be made. A 1:1 ratio would give gearing of the maximum efficiency and durability, which is practically the ratio required. When I speak of a ratio of 1:1, I am treating it as a higher ratio than 1:5, or a lower ratio than 5:1.

30 In the second quotation, Defendant's expert gives his reason for not being able to get a higher ratio than about 1:5, as being due to the fact that it would be impossible to get the required tooth dimensions to stand the shock strains on the gears of the size indicated on the patent drawings when enlarged to the actual size of the machine. In my opinion, the question of tooth dimensions has nothing to do with the subject whatever, as it is possible to use almost any size tooth within a wide range, without regard to the size of the gears. Of course, in the usual system of gearing, it is generally impractical to use less
40 than 12 teeth in a gear, owing to the fact that the teeth

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become under-cut when a fewer number are used and thus weakened. This minimum of teeth refers, however, to spur gearing more particularly, and in spiral gearing it is possible to use a fewer number of teeth than in spur gearing because, due to the angle, they do not become so under-cut. In the actual size of gears used in the full sized machine, however, and even if kept in exact proportion to the patent drawing, the size of tooth required to transmit power is such that the number of teeth becomes very much greater than the minimum, so there is no difficulty whatever on this score. 10

In the third quotation from Defendant's Expert's deposition referred to he further states his reason for setting the ratio of 5:1 as the limit, as being due to the use of 45 teeth in the low speed gear. I have gone over this matter and find that this limitation of 45 teeth does not affect the high speed transmission, as Defendant's expert has indicated; using such a number of teeth in the low speed gear still permits a tooth of ample size in the high speed gear to transmit the power required. 20

Q. 87. I also call your attention to the following statement from the testimony of Defendant's expert:

"This problem would have to be solved either by calculation or *experiment, probably the latter, before anyone could tell whether teeth of proper proportion to stand the strains and transmit the necessary power could be cut of the required number and at the required angle on blanks of the relative diameters given and have the necessary strength.*" (Italics mine.) 30

What have you to say in connection with this statement?

A. It would only be necessary to make a simple calculation to determine the size of tooth and all other data needed to build these gears to transmit the necessary horse power. All the necessary data was well known 40

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prior to 1907 and, of course, was based on experiments which had been conducted on gears for many years past. In fact any designer of ordinary ability could easily have designed these gears without experimentation.

Q. 88. You said that these data were known prior to the year 1907, will you give some authorities to substantiate your statement?

10 A. I would refer first to the book entitled "The Constructor", by F. Reuleaux, published by D. Van Nostrand Company, in 1893. The general subject of gearing is gone into extensively, beginning on page 127 and continuing to page 150. On page 138 spiral gears are particularly discussed, and the various methods of calculating the angles of the teeth, and number of teeth, and all other problems connected with the designing of these gears is developed quite completely. The carrying
20 capacity of the teeth of gears is also set forth fully in various parts of this section, included in which is the carrying capacity of spiral gears. There is ample information in this one book alone, to have properly designed the gears in question. I may note for instance that on page 140 of The Constructor, under Example 10, the following statement appears to indicate the synonymous use of the terms "worm" and "spiral" gears: "The worm, or endless screw, as already stated, is a form of spiral gear
30 wheel."

Plaintiff's counsel introduces the said treatise in evidence, marked: "Plaintiff's Exhibit No. 25, The Constructor".

Q. 89. Do you recall in your early studies of the subject any treatises or articles giving the necessary information, and which were published prior to the year 1907?

A. The Constructor, that has just been introduced in evidence as Plaintiff's Exhibit No. 25, was one of the
40 books that I studied and was very familiar with about

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the year 1900. I also was familiar with and studied numerous articles appearing in the American Machinist and other similar magazines before the year 1907, on the question of spiral gearing. I have here photostatic copies of an article from the American Machinist of January 13, 1898, which I do not remember seeing at the time it appeared but which I subsequently saw in various re-
prints which have been published. This article is entitled
"Modern Practice with Worm Gearing", by F. A. Halsey. I would like to refer in particular to a number of sections of this article, the first being on page 24-20. Near the bottom of the page, in the middle column, it states: "The essential change in practice which has improved the results obtained with worm gearing has been an increase in the pitch over what was formerly considered proper". And, also, near the bottom of the third column on the same page, it states: "The ratio of the lost work to the useful work is therefore reduced by the increase in the thread angle, and since the tendency to heat and wear is the immediate result of the lost work, it follows that that tendency is reduced. For small angles of thread the change is very rapid, and continues, though in diminishing degree, until the angle reaches a value not far from 45 degrees, when the conditions change and the lost work increases faster than the useful work, an increase of the angle of the thread beyond that point reducing the efficiency." On page 21-25, or the second page of this article, there is shown a diagram marked "Fig. 2.—Relation between Thread Angle and Efficiency." This diagram has two curves, the upper one being the efficiency of the gears alone, and the lower one taking into account the efficiency of the thrust bearing. They are very similar, and for our purposes we can consider the upper curve. This shows the maximum efficiency of the gear alone or the worm alone, as occurring at an angle of 43° and $34'$; 40

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the curve, however, is almost flat between an angle of 30° and an angle of 60° , showing that a worm of any of these angles could be used with practically equal efficiency. It states, on this same page, near the bottom of the third column, 'Thus, for the upper curve there is scarcely any choice between 30 and 60 degrees of angle, and but little drop at 20 degrees.'

- 10 This article was continued in the January 20th number of the American Machinist of 1898, and I refer to page 48-24, near the middle of the first column, where it states: "Mr. Christie has made many successful changes, of which these are typical, and he now uses worms with great freedom and success. His general conclusion is that good worms begin with those having the pitch about equal to the diameter, giving a pitch angle of $17^\circ 15'$." In this connection I might call attention
- 20 to the fact that such an angle would correspond roughly to a ratio of 1:5, set forth by Defendant's expert as being the highest permissible ratio. As a matter of fact, the information and data set forth in this article show that 1:5 is closer to the lowest ratio for the best practice. I observe that Defendant's expert has used both the ratio of 1:5 and 5:1 but I assume that it means the same in both instances, and that he considers 1:1 a higher ratio than 1:5, on which understanding I am now discussing the
- 30 subject.

This article continues, as follows:

"Three other cases of successful worms under heavy duty are found in milling machines which have been repeated many times. The first two worms would be ordinarily described as spiral gears. The shafts are at right angles and the action is that of worms, and they are properly included here."

- 40 "The first of these, which appears as 14 in the diagram, has a pitch diameter of $2\frac{1}{4}$ inches, a pitch

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angle of 45° , and a speed varying between 180 and 945 r.p.m., giving pitch line velocities of 106 to 555 feet per minute."

I am calling attention to this last paragraph as some writers tend to call a spiral gear with a few teeth, giving a small angle with the plane of the gear or a large angle with the axis, a worm. Here is one having an angle of 45° , which this author calls a worm and which he appreciates some might call spiral gears. That is the finish of that article. 10

I also wish to refer to another article appearing in the November 14, 1901 issue of the American Machinist, page 1261, entitled "Spiral Gears" by F. A. Halsey. This article in general gives the method of finding the angle of the tooth, the number of teeth, the diameter of the gear, and all the usual information necessary for laying out these gears. I wish to refer particularly to the middle ²⁰ column of page 1262, about the middle of this column, where it says: "In the extreme case of a spiral gear in which the helix angle is so small that the gear becomes a single thread worm, as in Fig. 4, points *o* and *d* coincide and the length of the helix between *a* and *d* becomes the normal pitch."

I should also like to refer to the bottom of page 1262, the same article, where it states:

"Geometrically speaking, there is a wide range ³⁰ of choice in the helix angle. As regards the desirability of different angles from the standpoint of durability, the conditions are essentially the same as in worm gearing. Reference to the article, 'Modern Practice with Worm Gearing', published in the issues of January 13 and 20, 1898, will show that the most favorable angle for durability is 45 degrees. There is, however, but a trifling increase in wear down to 30 degrees, no serious increase down to 20 degrees, 40

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10 and no destructive increase down to about 12 degrees. Where gears are to transmit considerable power the best result should attend the use of angles between 30 and 45 degrees, while angles as low as 20 degrees may be used without hesitation, and as low as 12 degrees if the gears are to run in an oil bath or do light work only. The angle may also be increased above 45 degrees by similar amounts and with similar results."

These are all of the particular passages which I wish to refer to, but the whole article gives a great deal of information on all the aspects of the problem.

20 Plaintiff's counsel introduces in evidence the photostatic copies referred to, marked "Plaintiff's Exhibit No. 26, American Machinist Articles".

Q. 90. You have stated that these articles appearing in the American Machinist have been reprinted. Can you give me any instance of such reprinting? Of course, I am not referring to the exact verbiage, and am not asking you to compare the two treatises word for word. It is substance I am after rather than exact form.

30 A. These articles were reprinted in substance in a book entitled, "Worm and Spiral Gearing", by Frederick A. Halsey, and published by D. Van Nostrand Company, the original edition appearing in 1902. I have a later edition of this, reprinted in 1918, which I know to be substantially the same as the original articles.

Plaintiff's counsel introduces the said treatise in evidence, marked: "Plaintiff's Exhibit No. 27, Worm and Spiral Gearing".

40 Q. 91. You have stated that Plaintiff's Exhibit No. 27 is a substantial reprint of the articles embodied in Plaintiff's Exhibit No. 26. Do you find, for instance, the

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charted efficiency curve, that you have already testified about, in Plaintiff's Exhibit No. 27?

A. Yes. It is contained in this book in the form of a chart, at the back end.

Q. 92. And do you find that same charted efficiency curve, or substantially the same curve, in other standard treatises of later date?

A. Yes, it is printed on page 184 of the American Machinist Gear Book, by Charles H. Logue, published in 1915 by the American Machinist. 10

Plaintiff's Counsel introduces in evidence the said treatise, marked "Plaintiff's Exhibit No. 28, American Machinist Gear Book".

Q. 93. Referring, for instance, to page 191 of this treatise, Plaintiff's Exhibit No. 28, do you find any statement relating to the limit of pitch angle?

A. Yes. It states that good worms begin with those having a pitch angle of $17^{\circ} 15'$, as being the conclusion of Mr. Christie. 20

Q. 94. Have you examined the spiral gearing in Plaintiff's Exhibit No. 2, and, if so, please compare it with the spiral gearing in the ordinary Goodyear commercial machine.

A. Yes, sir, I have examined the spiral gearing in the State machine, Plaintiff's Exhibit No. 2, and also in the ordinary commercial Goodyear machines in use in the Goodyear factory. I find that these gears are the same. 30

Q. 95. State whether or not the speeds are the same in Plaintiff's Exhibit No. 2 as in the Goodyear commercial machine, and, if any, how the difference of speed is obtained.

A. The speeds are different. The machine of Plaintiff's Exhibit No. 2 operates at considerably higher speed. This difference in speed is obtained by changing the spur gears on the rear end of shaft 90 (the core shaft) and shaft 70 40

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(the clutch shaft), these figures referring to the drawings of the patent in suit. The machine of Plaintiff's Exhibit No. 2 has a spur gear on shaft 70 containing 58 teeth, meshing with a gear on shaft 90 having 30 teeth. In the machines in use in the Goodyear factory, these two gears each have 44 teeth which consequently reduces the speed of the core shaft to almost half that of the core shaft in
10 the machine of Plaintiff's Exhibit No. 2.

Q. 96. In other words, then, if I understand you, the lowest speed in the Goodyear commercial machine is not secured by variation in the spiral gearing itself, but rather by changes in the spur gearing between the clutch shaft and the core shaft, is that correct?

A. Yes, that is correct.

Q. 97. In connection with the allegations of impracticability advanced by Defendant's expert, of the spiral
20 gearing, etc., in the State patent in suit, have you endeavored to embody in any working machine or model the spiral gearing of the patent?

A. Yes. I have had constructed a working model of the machine shown in the State patent, to a scale of one-half full size, and have made the proportions of all the gearing the same as that shown in the patent drawings, as near as I could determine them. This machine is a practical operative machine, and tires have been constructed
30 upon it without difficulty.

Q. 98. Are the forms of spiral gearing, etc., embodied in this model, substantially the same as those described by Plaintiff's expert, Mr. Browne, in his *prima facie* deposition?

A. Yes, they are the same.

Q. 99. In this model you refer to, are the fast and low speeds, respectively, mounted in the same position as they are in Plaintiff's Exhibit No. 2 and in the Goodyear commercial machine?
40

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A. No, they are not. They are mounted in the same position shown in the State patent in suit, in accordance with Mr. Browne's explanation of it.

Q. 100. What is the high speed of the core in the model you refer to? Is it 230, as in Plaintiff's Exhibit No. 2, or is it 207, as set forth in the State patent in suit?

A. Neither. It is approximately 293.

Q. 101. Why did you provide a speed of 293, which is 10 so much higher than that presented in Plaintiff's Exhibit No. 2, or in the Goodyear commercial machines, or in the State patent in suit?

A. As this machine is one-half size, I increased the speed of the core so as to keep the effect of centrifugal force the same as that which would occur at the speed set forth in the patent in suit in case of a full size core. In other words, the full size core would operate at 207 in accordance with the patent, and to give the same centrifugal effect on a half size core it would have to operate 20 at 293.

Q. 102. What is the speed ratio in the model you refer to between high speed and low speed?

A. $1:34\frac{1}{2}$, which is the same as set forth in the State patent.

Plaintiff's counsel introduces in evidence the model referred to, marked "Plaintiff's Exhibit No. 29, Model of State Machine".

By Mr. Seward: I object to the reception in evidence of this model, as incompetent, immaterial and irrelevant. 30

Q. 103. You have already referred to the hydraulic bursting tests you employed in connection with the tires, Plaintiff's Exhibits No. 18 and No. 19. What other tests for tires do you know of?

A. I am familiar with the method of testing tires which is commonly called the road test, wherein a very 40

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large number of tires are placed upon test cars and driven to destruction under certain conditions, and a record kept of the behaviour of the tires during this time.

Q. 104. Why did you not employ such a road test in connection with the tires, Plaintiff's Exhibits No. 18 and No. 19?

10 A. I gave this matter of tests very careful consideration and came to the conclusion that a road test was impractical because it would have required, in my opinion, something like a thousand tires of each variety, as well as from one to two years to conduct. The expense would have run into several hundred thousand dollars, and the time available which I had for conducting these tests was not sufficient to consider it.

Q. 105. Have you, since defendant's expert gave his deposition, visited any of the tire factories which use
20 defendant's machines, for the purpose of observing them in operation?

A. Yes.

Q. 106. Will you state what factories you have thus visited?

A. I have visited the Lee factory, at Conshohocken, Penn.; the Zee-Zee factory, near Trenton, N. J.; the Ajax factory, at Trenton, N. J.; and the Racine factory, at Racine, Wis.

Q. 107. Are these the only factories employing de-
30 fendant's machines that you have ever visited?

A. Yes.

Q. 108. What was your purpose in making these visits?

A. I wished to observe the means for forming the fabric upon the sides of the core, and the method of using these means practiced commercially by these companies, and see if these methods of using them were the same as the method observed by me in defendant's exhibition of its machine which I observed at Trenton, N. J. I was
40 advised by counsel that defendant's expert in substance

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contended that such a mode of use indicated that the machine is an automatic one.

Q. 109. Were these machines that you observed at these four factories substantially similar to the machine that was demonstrated by defendant at Trenton, N. J., in respect of the forming rolls and the operating devices therefor?

A. Yes, they were similar in those respects.

Q. 110. Did you observe the other parts of these machines to any extent? I refer more particularly, by way of illustration, to the fabric supply devices, tension devices, bead-applying devices, and other mechanisms not closely related to the side forming rolls.

A. No, I did not inspect these machines closely in respect to these latter mentioned parts, as I was chiefly interested in the side forming devices.

Q. 111. Do you recall at the exhibition of Defendant's machine that you observed at Trenton prior to the beginning of evidence in this case, how the slide or carriage which supports the forming rolls was advanced during the forming roll operation?

A. Yes, I believe, if my recollection is clear on that matter, the carriage was advanced by the screw which was operated by power.

Q. 112. In other words, at the Trenton demonstration of defendant's machine, the slide or carriage was advanced mechanically and not manually, is that correct?

A. Yes, that is my recollection of it.

Q. 113. And at the four factories which you visited and where you observed defendant's machines in operation, were the slides or carriages advanced mechanically or manually?

By Mr. Seward: Objected to as immaterial, incompetent, irrelevant, and not rebuttal testimony.

A. In the machines which I observed in these four factories, the slide carrying the stitcher arms was ad-

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vanced manually in all cases, the operator turning the hand wheel mounted upon the screw which feeds the carriage inward.

Q. 114. Now next state what you observed as to the angle of the forming rolls during the time the rolls were advanced along the sides of the core to form the fabric thereon.

10 By Mr. Seward: Same objection; and it is agreed that this objection may stand through all further testimony as to these machines, without repetition.

A. These forming rolls stood at a receding angle with the core during the whole time that they were acting upon the fabric upon the sides of the cores. By "receding angle" I mean that the rolls were maintained at an angle relatively to the plane of the core, similar to that shown in Figure 12*b* of the State patent in suit.

20 Q. 115. During this advance of the rolls along the sides of the core, at the four factories you have mentioned, was the angle of the roll changed with respect to the plane of the core, and, if so, when?

A. No the angle was not changed during the advance of the rolls upon the side of the core. After the bead was placed on top of the one or two plies first laid upon the core, and the fabric which goes outside of the bead formed down to the inner edge of the bead, then the angle of the
30 rolls was changed so as to form the fabric under the bead or on the bottom side of the bead, but it was not changed during the forming of the fabric upon the sides of the carcass.

Q. 116. And this was true of all four of the factories you mentioned?

A. Yes.

Q. 117. Next, with reference to the means employed for pressing or forcing the rolls against the side of the
40 core during their inward or forming movement, what

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means and method were employed at the four factories you have mentioned?

A. There were two different methods employed in these factories, both in turn being different from the method I observed during the exhibition of defendant's machine.

Q. 118. Will you specify the different methods you have referred to in your last answer?

A. In the Lee factory the machines were equipped with weights which pull these forming rolls against the sides of the core, but the pressure which they exerted upon the core was controlled by the operator manually by operating the hand wheel, which in turn through a worm controls the horizontal disk, which in turn through connecting rods controls the movement of the stitcher arms; these connecting rods were made fast to this disk so that the position of the stitcher arms and consequently the position of the forming rolls was under control of the man¹⁰ operating this hand wheel; he so operated it that the forming rolls were in contact with the fabric upon the sides of the core during the inward travel of these rolls, but it was impossible to determine just what pressure was being exerted by the rolls against the core; that is, I could not tell whether the whole of the pressure exerted by the weights was being used, or whether only a part of it, or whether, even, he was adding to the pressure of the weights.

The same mode of operation exactly was followed in³⁰ the Zee Zee factory, and in the Ajax factory.

In the Racine factory, the weights had been removed and the stitcher arms were pressed against the sides of the core by means of springs which were interposed between the horizontal disk and the outer ends of the stitcher arms. In operation, the operator controlled the pressure on these springs by turning the hand wheel which, through the worm, controls the horizontal disk. The whole pressure, however, of the forming rolls against⁴⁰

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the sides of the core was due to the compression of these springs.

Q. 119. Did you observe in these four different factories, the fabric as it was being laid upon the side of the core?

A. Yes, I did.

10 Q. 120. And did you note carefully the condition of that fabric as it was being laid upon the side of the core?

A. Yes.

Q. 121. Will you state whether or not you observed the fabric sufficiently well to determine whether or not the reticulations of the fabric had been changed so as to show diamonds with their long axes radial?

A. Yes, I did. I paid particular attention to this point.

20 Q. 122. And you actually saw in each of these four factories, diamonds in the fabric, in or near the bead portion, with their long dimension radial, is that correct?

A. Yes, that is correct.

Q. 123. Will you state whether or not you have observed a similar phenomenon in connection with the Good-year commercial machines at Akron?

A. Yes, I have observed the same phenomenon, and have observed the diamonds in the bead portion of the tire with the long axes radial, many times.

30 Q. 124. Were these radial diamonds, that you saw in the fabric in the four factories using defendant's machines, readily perceptible?

A. Yes, these diamonds were readily perceptible in all cases. In some of the factories where the friction coating was dark, it could only be seen where this was knocked off by the stitcher rolls; but in the Ajax and the Racine factories, the friction coating was quite transparent and it was very easy to see the diamonds there at all points.

40 Q. 125. Now, will you state whether or not you have purchased the actual commercial tires of the four con-

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cerns using defendant's machines you have already referred to?

A. Yes, I have purchased one each of these tires, namely, the Lee, Zee Zee, Ajax, and Racine.

Q. 126. How did you purchase these tires?

A. I purchased them in New York City from their regular retail branches here, with the exception of the Zee Zee tire which I purchased from an ordinary retail dealer on Broadway. 10

Q. 127. And are these tires marked with some name to indicate the concern that manufactures them?

A. Yes, they all bear the manufacturer's name.

Q. 128. Will you kindly produce the four tires named?

A. I here produce them.

Plaintiff's counsel introduces the four tires in evidence, marked, respectively, "Plaintiff's Exhibit No. 30, Ajax Tire"; "Plaintiff's Exhibit No. 31, Lee Tire"; "Plaintiff's Exhibit No. 32, Zee Zee Tire"; "Plaintiff's Exhibit No. 33, Racine Tire". 20

By Mr. Seward: Same objection as to last exhibit, and it is agreed that this objection may stand against all testimony with reference to these exhibits, without repetition.

Q. 129. Will you examine the four tires, Plaintiff's Exhibits No. 30, No. 31, No. 32, and No. 33, and state whether or not you find therein diamonds with their long dimension radial in or near the bead portion? 30

A. I have examined these tires and find that there are diamonds present in the bead portions of all four tires, with their long axes radial. Certain portions of the outer covering and some portions of the layers of fabric have been loosened or removed from these tires so that the inside fabric is visible.

Q. 130. Are there any markings on the fabric in these 40

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four tires to assist in showing the diamond formation you have referred to?

A. Yes, certain of the threads have been outlined with black pencil so that larger diamonds in black lines appear on the fabric.

Q. 131. What do you mean by "larger diamonds"?

A. I mean diamonds containing a number of threads
10 within their boundaries in each direction.

Q. 132. That is to say, you mean that each of the larger diamonds that are indicated in black pencil comprise a number of smaller actual diamonds?

A. That is correct.

Q. 133. And in this way you make the angularity of the diamonds more appreciable to the eye, is that correct?

A. Yes.

Q. 134. Will you state whether or not you have had
20 made a tire relying largely or entirely on circumferential stretch to secure the formation of the fabric to the core?

A. Yes, I had such a tire made under my direction in the Goodyear plant.

Q. 135. Are you able to produce this tire?

A. Yes, and I herewith produce it.

Plaintiff's counsel introduces the tire in evidence, marked "Plaintiff's Exhibit No. 34, Tire Made by Circumferential Stretch".

30

By Mr. Seward: Same objection, and it is agreed that it may stand without repetition against all testimony in relation to this tire.

Q. 136. Do I understand that in this tire you relied entirely on circumferential stretch, and that no radial stretch was employed?

A. Yes, that is correct. The forming of the fabric was done entirely by circumferential stretch. There were
40 no tools used to form it on the sides, the plies simply

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being cemented together, pressed together, by use of the fingers, on the undercut part of the core.

Q. 137. Have you cut open the rubber cover so as to expose the under fabric in this tire, Plaintiff's Exhibit No. 34?

A. Yes, I have done so in several places.

Q. 138. And do you find diamonds in the bead portion of this tire, Plaintiff's Exhibit No. 34?

A. No, there are squares in the bead portion.

10

Q. 139. Are there any diamonds at all in the fabric of this exhibit tire?

A. There are no diamonds with their long axes radial, but on the sides of the tire there are diamonds with their long axes circumferential, which become more pronounced toward the center of the tread portion of the tire where they are at maximum.

Direct-examination closed.

20

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 140. When you saw Mr. Mackey make his tires by hand-spinning, who placed the beads?

A. Mr. Mackey placed most of the beads. Mr. Shaw, I think, assisted him in a few cases.

x-Q. 141. When you say Mr. Shaw assisted him, do you mean that the two of them placed some of the beads together, or do you mean that Mr. Shaw placed some of the beads all by himself?

30

A. I mean that Mr. Shaw placed a few of the beads on by himself, to hurry along the work.

x-Q. 142. Did you help Mr. Mackey at any time in the making of these tires?

A. I would hardly say that I helped him. I observed him mostly. I may have assisted him in measuring the thickness of the plies a few times,—practically no help whatever on my part.

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x-Q. 143. Did you help him at any time in stretching the fabric on the core?

A. I may have put my hand on the core once or twice to steady it on the stand,—in fact I think I did.

x-Q. 144. What do you mean by “steady it”?

A. Well, it was rather difficult in getting the end of the fabric to hold onto the core. That is, in starting the
10 ply he would attach the end of the strip of fabric to the core, and as he did not want to have any more of the fabric than possible sticking to the core, at times when he pulled it, it would pull loose at the end, and I think I placed my hand on top of it so as to steady the core, and I may have helped to prevent the core from rotating slightly by doing that.

x-Q. 145. Did anybody else assist Mr. Mackey?

A. I believe Mr. Shaw put his hand on the end of the
20 fabric once or twice in the same way, but that is the only assistance that Mr. Mackey was given in either applying the fabric or stretching it on, or in spinning it down.

x-Q. 146. Did the core he used have a pawl and ratchet or some other device for holding it against rotation while the fabric was being stretched circumferentially?

A. No, the core was mounted upon a spider which rotated on ball bearings on the core stand. Mr. Mackey prevented it from rotating while stretching the fabric on,
30 by leaning his apron and his leg against the core.

x-Q. 147. And there was no other means for preventing the core from rotating while the fabric was being stretched circumferentially?

A. None, whatever.

x-Q. 148. Did you analyze the rubber used for the cover of these tires, or test it in any way?

A. No. This was the standard stock with the standard friction coating, used by the Goodyear Company.

40 x-Q. 149. How can you say that it was standard?

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A. I instructed Mr. Shaw to obtain the standard stock, and I was informed that it was the standard stock; and, furthermore, it appeared to be the same as the standard stock which I have seen used from time to time, and I know from my knowledge of the factory and the methods which they use in producing this, that it would be very difficult to obtain anything else, so that I have every reason to believe that it was the standard stock.

x-Q. 150. Then you believe this was the standard stock¹⁰ used for the cover or cushion of the regular Goodyear tires?

A. Yes, I firmly believe that.

x-Q. 151. You do not believe, do you, that it was the standard stock used for the tread of the regular Goodyear tires?

A. No, there was no tread applied to these tires.

x-Q. 152. Do you know whether or not there is a difference between the cover or cushion stock and the tread²⁰ stock which is used as standard by the Goodyear Company?

A. I do not know from my own knowledge, that is from analysis, or anything of that kind. I have understood that there was a difference.

x-Q. 153. And you believe there is a very marked difference, do you not, in the compositions used for these two purposes?

A. I believe so.

30

x-Q. 154. I understand you to say that the apparatus you used in testing these tires made by Mr. Mackey and Mr. Shaw, embodied in Exhibits No. 18 and No. 19, was specially made for that purpose?

A. Yes. The apparatus was specially made for this purpose.

x-Q. 155. Who designed that apparatus?

A. It was my suggestion that it should be made, but the particular proportions of the rim were laid out by⁴⁰

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some of the Goodyear designers, and then later the bull-ring was constructed at my request and substantially as I directed them. The general arrangement of the apparatus was about as I had directed them to prepare it.

x-Q. 156. Is it correct to say that you designed the form of the apparatus and its elements, except as to their particular dimensions?

10 A. I think that will be substantially correct.

x-Q. 157. Where did you obtain your ideas for this design?

A. Well, I have been long familiar with bursting tests in connection with machinery in general,—possibly from that familiarity,—it might have suggested the possibility of conducting these tests. I am not just certain, of course, what suggested the idea to me, except that the whole idea of the tests came as a result of my study of
20 the stresses in these tires under internal pressure.

x-Q. 158. Did the Goodyear Company, so far as you know, have apparatus for conducting this test?

A. I do not know just what apparatus they did have available.

x-Q. 159. Did you not say that you know they do use such a test for the tires?

A. That is true, but I do not know all the apparatus they have. They use their rims,—such for instance as
30 they use for vulcanizing,—they have used such rims for testing, and I did not investigate to see just what they did have.

x-Q. 160. Why did you not investigate and determine and use the apparatus employed by the Goodyear Company for this purpose, instead of designing your own apparatus?

A. At the time I suggested making these tests I did not know anything about any previous tests the Good-
40 year Company had made in these lines, so it naturally

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did not occur to me to see what apparatus they might have.

x-Q. 161. Did you ever see the Goodyear Company make such a test?

A. No, I have not seen them make the tests themselves. I have seen a number of tires being made for these tests, and I have discussed with the engineers the results of these tests afterwards, and I have given certain formulas 10 by which it is possible to calculate the stresses in tires, and these tests have been conducted partly to verify these formulas; so that I have been quite familiar with the work they were doing, although I did not happen to be out there when they were conducting the tests.

x-Q. 162. So far as you know, did the Goodyear Company use such a test before you made the tests on these exhibits?

A. I only know from statements made to me by Goodyear engineers and men who have conducted these tests. 20 They stated that they had done it in the past.

x-Q. 163. Then this kind of testing was not applied by the Goodyear Company as a result of your advice or suggestion?

A. No, not at all. The tests which I speak of as being quite familiar with, were started by engineers connected with the designing of tires; before I heard of them they had been started and the tires were under construction, so I do not believe that it was due to my work that it 30 was started.

x-Q. 164. As I understand, you did not hear of such tests by the Goodyear Company until after you had made the tests on these exhibit tires, is that correct?

A. No, I had heard of it before I actually made the tests, but after I had started to do so.

x-Q. 165. How far along were you in the tests on the exhibit tires when you heard of this?

A. The first time I recollect hearing about the Good- 40

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year Company conducting such tests was, I think, about last November, when I went out to the Goodyear plant under the impression that my apparatus was ready (which I found however not to be the case), and upon that occasion I then heard of Goodyear having previously done work on these lines.

10 x-Q. 166. Mackey and Shaw did not make these tires until May of 1920, did they?

A. That is correct.

x-Q. 167. Did you ever see the apparatus the Goodyear Company has used for such hydraulic tests?

A. No.

x-Q. 168. Then you do not know how it compares with the apparatus you employed in testing these exhibit tires?

20 A. Yes, I think I do know, because of my familiarity with the general subject,—the apparatus was exactly similar in fact.

x-Q. 169. Was there any difference?

A. No difference in anything except mere details.

x-Q. 170. What were those details?

A. Different rims were used.

x-Q. 171. By "rim" you refer to the part which you have marked on your sketch of this apparatus marked "Rim in Halves"?

30 A. Yes, and I also refer to the bull-ring as being different.

x-Q. 172. How did the bull-ring differ?

A. In these particular tests that I refer to, no bull-ring was used whatever.

x-Q. 173. No bull-ring was used by the Goodyear Company?

A. By the Goodyear Company,—due to the fact that they were able to get along without it.

40 x-Q. 174. When tires are in position on the rim of a vehicle for use, no bull-rings are employed, are there?

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A. No. It is not necessary in that case, as the pressure is so low.

x-Q. 175. Who mounted these exhibit tires on the apparatus for the tests?

A. Mr. Shaw and Mr. Johnson.

x-Q. 176. You were present when they were mounted?

A. Yes, I was.

x-Q. 177. Who else was present? 10

A. There were a number of different people present at different times. Mr. Trogner was there at times, and possibly a number of other workmen in the factory; and in addition, a Mr. W. C. Lincoln was present, took the readings with me but independently of me, so as to if necessary corroborate my results.

x-Q. 178. Is Mr. Lincoln an employee of the Goodyear Company?

A. Yes, he is. 20

x-Q. 179. Who operated the needle valve in the tests?

A. I did most of the time, but sometimes Mr. Lincoln did.

x-Q. 180. Did you read the gage during the times when you operated the needle valve?

A. I read the gage at all times, both when I operated it and when Mr. Lincoln operated it, and he did likewise.

x-Q. 181. How large was the gage in diameter?

A. The gage was a twelve inch Crosby test gage graduated to 600 pounds, in two pound divisions, and which was purchased by me for this purpose. Single pounds can be readily read from the gage. 30

x-Q. 182. I understand you mean it reads from zero to 600 pounds, in two pound divisions?

A. That is correct.

x-Q. 183. What is the purpose of the valve immediately adjacent the gage?

A. That is simply a valve which is used to shut the 40

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gage off when not in use, so as to avoid the danger of the whole 1500 pounds pressure going on it and ruining it.

x-Q. 184. Did you operate that valve at any time?

A. Yes. I, of course, opened it at the beginning of the test and I saw that it was open all the time, and I closed it off at night when we got through; and I opened the waste valve, which is shown on the sketch, to avoid any possibility of injuring the gage.

x-Q. 185. Did anybody else operate either of these two valves?

A. Not during the testing of these tires.

x-Q. 186. What do you mean by "during the testing"?

A. Well, I mean during the actual taking of the readings. Mr. Shaw may have opened them in the first place to let the tire fill with water, but in the majority of cases I also did this.

20 x-Q. 187. Was this valve adjacent the gage shut off after the testing of each tire?

A. No, only at nights, and when we finished with the test. We took care to open the waste valve, which in itself would prevent any pressure acting on the gage.

x-Q. 188. Was the waste valve opened after the testing of each tire?

A. Yes, as a rule it was.

x-Q. 189. Who did that?

30 A. I did in the majority of cases. Mr. Lincoln may have sometimes.

x-Q. 190. Who closed this waste valve at the beginning of the test of each tire?

A. Either Mr. Lincoln or myself,—I usually.

x-Q. 191. Who connected the hydraulic hose to the tire?

A. Mr. Shaw and Mr. Johnson would do that.

x-Q. 192. I understand that these half rims of this device were held in position by the bolts shown?

40 A. Yes, they were held together by the bolts, but you

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note there is an offset joint there which keeps their axes the same.

x-Q. 193. Who fastened these bolts at the time each one of these exhibit tires was placed on the apparatus for test?

A. Mr. Shaw and Mr. Johnson did that.

x-Q. 194. What kind of inner tubes were used in these tests?

A. These were standard Goodyear inner tubes, known, I believe, as heavy tourist's tubes, with the spreader removed from the valve stem. By the spreader I mean a kind of oblong washer which prevents the inner tube from blowing out around the valve stem in the ordinary use of the tube. This washer is held onto the stem by means of a nut. We had to remove this, because it is in the form of an arch and it keeps the inner tube away from the rim. Under this extremely heavy pressure, the inner tube would blow out around this spreader, so we found that we had to use instead a circular washer which fitted in the recess in the bull-ring so that the supporting surface of the inner tube would be practically smooth. The valve was also removed from the valve stem. 10
20

x-Q. 195. Did you use a different tube for testing each tire?

A. Yes. The tube blew out when the tire burst in each case.

x-Q. 196. And in no case was a tube repaired and used again?

A. No, in no case.

x-Q. 197. So you used twenty-two different inner tubes in this test?

A. Yes, we did.

x-Q. 198. About how long did it take the pressure within the tires to rise from the preliminary pressure of 100 pounds or so to the average bursting pressure?

A. Oh, approximately, three minutes or so. We would 40

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start off more rapidly and when we reached about 300 pounds we would slow it down so that the pointer of the gage would pass over a pound division in from a half to a second perhaps, so that we could readily count each pound as it went up,—slow in fact, the counting was.

x-Q. 199. Were the figures you have given the exact readings of the gage?

- 10 A. They were the exact readings when the tire gave way. It was very easy to get these, as the pointer would usually remain steady for a few seconds just on the bursting point; that was due to the fabric gradually giving way and the tire enlarging slightly at that point, and then it would suddenly burst, and then go back; so that it was very easy to practically get exact readings, that is, I mean within a pound.

x-Q. 200. What happened to the gage when the tire burst?

- 20 A. The pointer would come back fairly quickly, within half a second maybe.

x-Q. 201. Was there a lot of noise when the tires burst?

A. Yes, there was, due to the presence of some air in them.

x-Q. 202. Did the tires burst in the part which you have referred to, or which Mr. Browne has referred to, and indicated on exhibits as "Tread Zone", in every case?

- 30 A. Yes, they burst in this zone. Whether the tear covered the whole of this zone in every case or not, I am not certain.

x-Q. 203. How long was the flexible hydraulic hose?

A. About ten feet.

x-Q. 204. And about how long do you say the pointer of the gage remained stationary immediately prior to the bursting?

A. As a rule, a few seconds. Perhaps in some cases a 40 second or even less.

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x-Q. 205. Was the bull-ring endless?

A. Yes.

x-Q. 206. And made of metal?

A. Yes, of steel.

x-Q. 207. And the divided rim was also of metal?

A. Yes.

x-Q. 208. Did you ever see hose being tested with hydraulic pressure at the Goodyear plant? 10

A. No.

x-Q. 209. Did I understand you to say that about 80 pounds air pressure would be the ordinary pressure used in tires of the size of these exhibit tires when on a vehicle?

A. I stated that they were inflated to 75 pounds.

x-Q. 210. That would be about the ordinary pressure to which they would be inflated on automobiles?

A. That is the proper pressure.

x-Q. 211. Describe the experiments which you made to 20 devise means to hold the beads on the tires in position during the tests.

A. We attempted to conduct preliminary tests with this ring, as shown in my sketch, without using the bull-ring, but found that the beads would not hold. That is, they would break and the inner tube would blow out along the rim before the fabric of the tire would give way. We started this way because some of the engineers of the Goodyear Company were under the impression that the 30 beads would hold; but after a good many attempts in which we had a great deal of difficulty, not only with the beads giving way but with the inner tubes themselves blowing out inside of the casing, owing probably to the expansion of the casing itself under this high pressure, and the consequent stretching of the inner tube at the point between the casing and the rim, we decided that it would be necessary to hold the beads in some manner and I suggested the making of a ring of this type. 40

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x-Q. 212. Was this difficulty which you experienced with the beads giving way or the inner tube blowing out, a thing that occurred before or after Mackey made his tires?

A. That was before Mr. Mackey made his tires.

x-Q. 213. How long before?

A. The fall of last year.

10 x-Q. 214. When you met with this difficulty, why did you not proceed to use the apparatus employed by the Goodyear Company for such tests?

A. It never occurred to me, and no one connected with the Company suggested it, so we simply proceeded along the lines which we had started.

x-Q. 215. So far as you know, when the Goodyear Company used a hydraulic test did they burst the tires being tested?

20 A. I so understood that they did. In fact, that was the object of their test.

x-Q. 216. Do you know whether or not the Goodyear Company employs a road test on vehicles, in testing its tires?

A. Yes, they do.

x-Q. 217. Do you know of any other tests employed by the Goodyear Company?

30 A. Well, they have a great many tests connected with the tires,—various portions of the tires, all of these various tests being for the purpose of determining some particular feature.

x-Q. 218. I mean some other test of finished tire or carcass, as distinguished from the elements.

A. I am not certain that at the present time they are giving their finished tires any other commercial tests than the road test. They go very extensively into this latter method of testing, using I understand from 500 to 5,000 tires of any particular size in approximately two years' time before they consider the test completed.

40 x-Q. 219. Can you explain why they go to that ex-

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pense and incur that delay, if the test to which you put these exhibit tires gives more accurate results when only ten or twelve tires of each kind are employed?

A. Yes. In testing the finished tire there are a great many other points under investigation besides the carcass itself. There is the wearing quality of the tread, the separation of the tread, the separation of the cushion, the breaker strip, the side walls, the question of rim cutting, 10 and possibly many other points which are necessary to know about the completed commercial tire but which are not involved in the question which I attempted to determine.

x-Q. 220. What was the question you attempted to determine?

A. I attempted to determine whether or not the stresses set up in a hand-made tire were greater than those set up in a machine-made tire, under exactly similar conditions of loading. 20

x-Q. 221. In the commercial test of the tires to which you have referred, is the question of unity of beads with the carcass involved?

A. Yes, certainly.

x-Q. 222. Is the question of buckles in the fabric involved?

A. Buckles would undoubtedly be shown up in the commercial test.

x-Q. 223. Is the question of separation of plies of 30 fabric involved?

A. Yes.

x-Q. 224. Is the question of accuracy, or formation, size and placement of the beads involved?

A. Well, in a way, I should say. Of course, that is easily determined by other methods.

x-Q. 225. What other methods?

A. Simple measurements, or fitting on of the rims, is all that is necessary to determine that. 40

Frederick Ray for Plaintiff—Cross.

x-Q. 226. They are fitted on the rim when they are put on the vehicles for road test, aren't they?

A. Yes.

x-Q. 227. Were these beads employed in the exhibit tires made by Mackey and Shaw, metal beads?

10 A. They have piano wire reinforcements inside sur-
rounded by fabric.

x-Q. 228. Are they inextensible?

A. Yes, practically so.

x-Q. 229. Are they very strong?

A. Yes, I should so call them.

x-Q. 230. You referred to some previous test you made on three hand-spun tires and four machine-made tires, all made by Mr. Shaw. Will you please give me the bursting pressure of each of those tires?

20 A. Yes. In my previous statement concerning these tires, I made a mistake, in that the second machine-made tire was not made by Mr. Shaw but was one that was taken from stock and was made in the regular production in the Goodyear plant, as far as I know.

Machine-made tires: 448, 450, 390, 440; average, 429.5.

Hand-made tires: 390, 373, 388; average, 383.6.

x-Q. 231. By "the second machine-made tire" just mentioned, you refer to the one which burst at 450 pounds?

30 A. That is correct

x-Q. 232. Did you see Mr. Shaw make three of the machine tires, and the hand-made tires?

A. Yes. Although I was not present every minute of the time.

x-Q. 233. Where did he make the hand-made tires?

A. He made them at 34 Barclay Street; and also the machine-made tires there.

40 x-Q. 234. Did he make those machine-made tires last spring?

Frederick Ray for Plaintiff—Cross.

A. No. They were all made, both the machine- and hand-made tires, about September 15th, last year.

x-Q. 235. Was the machine, Exhibit No. 2, driven by electric power when those machine-made tires were made?

A. Yes, it was.

x-Q. 236. When you said "34 Barclay Street" did you 10 mean here in New York City?

A. Yes.

x-Q. 237. Do you mean to say that the State patent in suit refers in the specification to either of the parts 76 or 82, as a spiral gear?

A. Yes, I would say so, indirectly, a worm being nothing but a spiral gear.

x-Q. 238. But do you mean to say that the specification of the said patent anywhere calls either of those elements 20 a spiral gear in so many words?

A. No.

x-Q. 239. Please identify the edition, the publisher, and date of publication, of the Standard Dictionary to which you referred.

A. I refer to the edition of the Standard Dictionary published by Funk & Wagnalls Company, of New York, and dated and copyrighted 1913.

x-Q. 240. In the State patent the gears 75 and 83 are 30 shown of the same diameter, are they not?

A. Yes, they appear to be.

x-Q. 241. They are shown as having similar teeth, are they not?

A. No, I would not say so, inasmuch as the teeth of the gear 83 are not shown.

x-Q. 242. Please look at Figure 3 of the drawing of the State patent and say whether or not a side view of a tooth of each of the gears 75 and 83 is shown.

Frederick Ray for Plaintiff—Cross.

A. Yes. A side view of each is shown, but that is not a sufficient showing to say that the teeth are the same.

x-Q. 243. Does that figure show any difference in the teeth on the two said gears?

A. No, there is no apparent difference in those views.

x-Q. 244. When you said that the power necessary for driving a State machine at a core speed of 207 R. P. M. was not over 2 H. P., on what did you base your statement?

A. On electrical measurements which were made at 34 Barclay Street, New York City, at my direction.

x-Q. 245. Was there any fabric on the core when these measurements were made?

A. No, I believe not.

x-Q. 246. Did you make the measurements yourself?

A. No, I had an electrical contractor do it in connection with installing a rheostat for controlling the speed.

x-Q. 247. Were the spinning rolls in contact with the core when these tests were made?

A. No, I think not.

x-Q. 248. Were these tests made when the machine was first installed at 34 Barclay Street?

A. No. It was some time afterwards. It was a considerable length of time before we were able to get the current, and we had so much difficulty in controlling the speed that I employed an electrical contractor to make these measurements and to install this rheostat to get the thing going properly so that we could make use of the machine.

x-Q. 249. Did he do this?

A. Yes.

x-Q. 250. I understood you to say that in your opinion any designer of ordinary skill could, within the proportions shown in the State patent in suit, easily lay out a worm and gear to occupy the places of the elements

Frederick Ray for Plaintiff—Cross.

and 83 in which the gear corresponding in position to 83 would be driven at a higher rate of speed than its worm. Is that correct?

A. Yes. That is my opinion, based upon calculations which I have made, which are sufficiently simple so that any designer who is familiar with trigonometry could have made the same calculations.

x-Q. 251. In using the expression "lay out" do you 10 mean to include illustrate or draw such gearing?

A. I mean to design such gearing; and by design I mean to give all the necessary information so that such gearing could be built by any machine shop having the usual equipment necessary to do this work. In making such a design it is not necessary for the designer to lay out the tooth forms, as these are absolutely standard and have been for a great many years. However, any ordinary designer who is laying out gears could easily 20 lay out the tooth forms if he so desired, but this is never done, it simply being necessary to give the pitch diameter and width of face of gear, size of tooth, the angle of tooth, and number of teeth in the gear. The drawings ordinarily made by designers are mostly concerned with other details of the gears; for instance, the hub diameter and bore, the number and size of arms, and it is very seldom that any data is given as to the teeth, at the most simply specifying the form of tooth,—that is, whether 30 an involute or some other form of tooth is to be used. This need not of necessity be given, as the involute tooth for such work is so standard and well known that it would be used without doubt if nothing were specified concerning the particular type of tooth.

x-Q. 252. How about the spiral form of tooth, would that be given?

A. There is nothing to the spiral form of tooth to be given. When the angle of the tooth is given, and the pitch diameter, and the size of the tooth, then there is 40

Frederick Ray for Plaintiff—Cross.

only one form which it can take and that it automatically takes when it is cut upon the milling machine.

x-Q. 253. Do you say that any ordinary designer could draw that form easily, and without experiment?

A. He could do so if he desired, but in practical drawings it never is done nowadays and has not been done for years and years, except in the case where cast
10 gears are made which used to be the old practice, or when gears with wooden teeth are used, which is also an old practice. In those cases it was formerly customary for the designer to actually design the particular teeth, but since gear cutting has come into practice there is no need for any designer to design the teeth, because this was done once for all by Brown & Sharpe in the ordinary system of teeth; they really design the teeth
20 when they make the milling cutters which cut them; and in using those cutters it is impossible to make any other tooth than the particular one which those cutters are designed to make. So it is simply a matter nowadays for the machine designer to specify those quantities which I have already mentioned,—Brown & Sharpe do the rest.

x-Q. 253. What I intended to ask you was whether or not, in your opinion, any machine designer of ordinary experience could easily draw the spiral of the teeth on the gearing under consideration?

30 A. Yes, he could easily do this, but of course it would take him a certain length of time; there is more or less detail work connected with it, but the knowledge as to how to do it is well known, has long been published, and anyone with ordinary ability can easily follow it; it is simply a proposition of laying out a helix.

x-Q. 254. Would it require a great deal of work?

A. It would require a considerable amount of work.

x-Q. 255. Even for such a successful designer as your-
40 self, is that correct?

Frederick Ray for Plaintiff—Cross.

A. I would not consider it a very difficult job and one that would take a very great deal of work.

x-Q. 256. Would it require a great deal of work?

A. No, I do not think so, on giving it consideration. I may have stated in my former deposition that it would require a great deal of work, but I think I will modify that by saying that it would not be extremely difficult, it would not require a great deal of work.

x-Q. 257. Would the driving spiral gear in such an arrangement be an endless screw? ¹⁰

A. Yes, just as much as any screw can be endless.

x-Q. 258. In one of the articles by Mr. Halsey to which you have referred, you have quoted something in which I understood him to intimate that a tooth angle of less than 12° would be a "destructive" degree. Is my understanding correct?

A. The quotation says that "no destructive increase down to about 12 degrees". He says that gears may be used without hesitation " * * * as low as 12 degrees if the gears are to run in an oil bath or do light work only". ²⁰

x-Q. 259. What do you understand he means by "no destructive increase",—destructive of what?

A. Destructive of the surface of the gear, due to wear. I think that he refers to continuous use.

x-Q. 260. And you think that would not be destructive in intermittent use?

A. It would, of course, be very much less so, depending upon the time of use. ³⁰

x-Q. 261. By 12° does he mean 12° to the axis of the gear?

A. No, he is measuring his angle from a plane perpendicular to the axis.

x-Q. 262. Can you tell me about what is the said degree of angularity of the teeth on the worm 76 in the State patent in suit, I mean measured with respect to a plane perpendicular to the axis of the said worm? ⁴⁰

Frederick Ray for Plaintiff.—Cross.

A. It looks something like 10 or 12 degrees,—of course I do not consider this a working drawing.

x-Q. 263. Do you say that this machine model, Plaintiff's Exhibit No. 29, is an exact reproduction of the machine shown in the State patent in suit?

A. No, it is not an exact reproduction of all parts of the patent in suit. For instance, the stock rack has been
10 simplified so as to take but one roll of fabric, as there seemed to be no reason to go to the expense and complication of simply duplicating these various stock rolls, as shown in the patent. The model I consider to be a very good illustration of the patent reduced to metal, and as far as important details are concerned it is about as near a copy of the patent as it is possible to make, in view of the fact that the patent drawings are not working drawings and have no dimensions.

20 x-Q. 264. Then this model, except for the stock rack, was as close a representation of the machine shown in the patent as you were able to make?

A. I think that would be substantially true, particularly as to the relation of the various parts and their general mode of operation. Some minor details are undoubtedly different from those shown in the patent, but the machine I think illustrates the general principles set forth in the patent very well.

30 x-Q. 265. How about the mechanical construction of the various parts?

A. They may differ in some of the details, which I take to be merely illustrative in the patent.

x-Q. 266. Did you try to make this model as close a reproduction of the machine of the patent in suit, mechanically, as you could, except for the stock roll support?

A. I tried to make the gearing a close copy of the
40 patent in suit, and the slide and turret for carrying the

Frederick Ray for Plaintiff—Cross.

tools, and the tools themselves, but as to minor details, such as the bed plate and various castings, I did not believe that they were points of issue and they undoubtedly differ in some of their details from those shown in the patent in suit.

x-Q. 267. I understand that in this model you increased the high speed of the core so as to increase the centrifugal force acting upon the fabric thereon, is that correct? 10

A. I increased the speed of the core so as to keep the centrifugal force acting upon the fabric the same as that which would act upon a full size core operating at a speed of 207, as set forth in the patent in suit.

x-Q. 268. What do you mean by a "full size core"?

A. In this case, this would correspond to a 36 inch tire, full size.

x-Q. 269. So that the core on this model is 18 inches in diameter? 20

A. It represents an 18 inch tire. Yes.

x-Q. 270. What is the law of centrifugal force with respect to the radius of the object being rotated?

A. The law is that it varies inversely as the radius but directly as the square of the peripheral velocity. It can be expressed in the formula: Centrifugal force equals $\frac{m v^2}{r}$, where m is the mass of the particle, v its velocity, and r the distance from the center to the particle. 30

x-Q. 271. Can you state about what would be the percentage of difference in centrifugal force acting upon fabric applied in the one case to the periphery of a 28 inch diameter core, and in the other case to the periphery of a 36 inch diameter core, both cores rotating at 207 R.P.M.?

A. It is in the proportion of 36:28, which is equivalent to 28 per cent. greater centrifugal force in the case of the 36 inch core, than in the case of the 28 inch core. 40

Frederick Ray for Plaintiff—Cross.

x-Q. 272. Then is it generally correct to state that in instances of this kind, the centrifugal force varies inversely as the diameter of the cores?

A. When the speed of rotation is kept constant.

x-Q. 273. What is the low speed of core rotation in this exhibit model?

10 A. Approximately $8\frac{1}{2}$ R.P.M.

x-Q. 274. Who was with you when you visited the factory of the Lee Tire & Rubber Company that you mentioned?

A. Mr. Luther E. Morrison.

x-Q. 275. Was anyone connected with the Lee Company with you?

A. One of the employees showed us through the factory, a Mr. Weller,—I believe that was his name.

20 x-Q. 276. Did you see any of the officers or managers of the Company at that time?

A. No, I did not.

x-Q. 277. To whom did you apply for permission to go through?

A. I had a letter of introduction, but I have forgotten the party who wrote it except that he was a representative of the Lee Company, and I presented that letter to a young lady in the office and Mr. Weller took us in tow and showed us through.

30 x-Q. 278. Who was with you when you visited the Zee Zee factory?

A. Mr. Luther E. Morrison.

x-Q. 279. Any representative with you when you visited that factory?

A. No, I believe we were shown through by the superintendent and we were introduced to Mr. Zimmerman, who I believe is an officer of the Company.

x-Q. 280. Did you use the same letter of introduction?

40 A. No, I did not have a letter of introduction.

Frederick Ray for Plaintiff—Cross.

x-Q. 281. Who was with you at the Ajax plant?

A. Mr. Murray, of the Empire Rubber Company, was with me.

x-Q. 282. Were any officers or managers of the Ajax Company with you?

A. Some gentleman connected with the Company, whose name I did not catch, showed us through. He appeared to be the man in charge.

x-Q. 283. Does the name Destribats renew your recollection? 10

A. That might have been it but I could not swear to that.

x-Q. 284. Did he have a beard?

A. I do not know. I think he was a Frenchman and that might have been his name,—it was a peculiar name and I could not quite catch it.

x-Q. 285. Who was with you at the plant of the Racine Company? 20

A. Mr. Harry Miller, of the Goodyear Company, was with me.

x-Q. 286. And did you meet any officer or manager of the Racine Company?

A. Yes, I met a number of people there. Mr. Tyler showed us through, and I was introduced to the superintendent, whose name I have forgotten for the moment. I cannot remember these names. I am sorry. I might mention that we visited the Racine factory more or less 30 in connection with another piece of patent litigation, and these facts which I have testified to in connection with this case were somewhat incidental.

x-Q. 287. Were you acting for the Racine Company in this other case?

A. Not at all,—for the Goodyear Company.

x-Q. 288. When was it, about, that you visited each of these four factories?

A. I visited the Lee Factory on February 10, 1920; 40

Frederick Ray for Plaintiff—Redirect.

the Zee Zee factory on April 5, 1920; the Ajax factory on July 15, 1920; and the Racine factory on July 27, 1920.

x-Q. 289. If the gear 83 of the State patent in suit has 45 teeth, how many teeth would have to be on the worm 82 in order to drive 83 at a higher rotative speed than 82?

A. There would have to be more teeth on the gear 82 to drive the gear 83 at a higher speed.

x-Q. 290. That is, more than 45?

A. Yes. Of course there is nothing shown to indicate that the gear 83 has 45 teeth.

x-Q. 291. Does the patent show any difference in size or dimensions between the gears 83 and 75, including the shape and dimensions of the teeth?

A. The patent drawings give no information as to the number of teeth on the gear 83, consequently I can see no way of comparing the number of teeth on the gear 83 to the number of teeth on the gear 75, but I consider this an immaterial point because it is possible to design the gear 83 with more than 45 teeth and do the required work.

Cross-examination closed.

REDIRECT-EXAMINATION BY MR. ROGERS:

Rd-Q. 292. You have stated on cross-examination that the gears 76 and 82 are not called spiral gears in the specification of the State patent in suit. Will you say whether or not they are described as meshing with the spiral gears 75 and 83, respectively, and if such be the case make such comment thereon as may occur to you?

A. They are so stated as meshing with spiral gears 75 and 83. Of course, if the gears 76 and 82 were a different type of gears it would be impossible for them to mesh and operate properly with the gears 75 and 83. As I have already pointed out and confirmed by referring to

Frederick Ray for Plaintiff—Redirect.

numerous authorities, what is often called a worm is nothing more or less than a spiral gear. What is called a worm looks somewhat different to the casual observer than a gear that is commonly called a spiral gear. He observes the teeth encircling the gear completely in the case of the worm, whereas in the case of the spiral gear there is just a little short section of teeth more nearly across the face. It looks different. He furthermore observes that the sides of the teeth of what he calls the worm are probably formed by a straight line; and he observes the teeth of what he calls the spiral gear curved, and naturally they look different, but there is no difference between them. They are both involute teeth, only it so happens that an involute tooth making a small angle with the plane perpendicular to the axis becomes a straight sided tooth, just like the teeth of a rack; whereas the teeth of a gear in which the teeth run more nearly across the face, become curved in order that they may be involute teeth. A worm is simply a spiral gear with one or two or three teeth, and it may have many teeth and still be called a worm by many writers, but usually it has one, two, three, or four teeth; whereas, what is called a spiral gear commonly, by many, has a larger number of teeth. In all gears, when the number of teeth change, the shape of the tooth must change, in order that they shall mesh properly, and so, for every spiral gear of a different number of teeth, there is a different shaped tooth used, and finally when it comes down to these gears with a fewer number of teeth, the sides of the teeth become straight, and if they were of any other form they certainly would not mesh with their spiral gears.

Rd-Q. 293. You have referred on cross-examination to the fact that the tires comprised in Plaintiff's Exhibits No. 18 and No. 19, when subjected to the bursting

Frederick Ray for Plaintiff—Recross.

test broke in or near the tread zone. What have you to say as to this particular effect and the reason for it?

A. It is due to the geometrical shape of the surface or the body of the carcass. The radius of curvature of the threads of the fabric is greatest in this section, due to the geometry of the thing, and as a result, for a given inner pressure, the stress becomes greatest in the threads at this portion and consequently, of course, they give
10 way, when the tires burst, at this portion.

Rd-Q. 294. You speak on cross-examination of an "endless screw". Will you kindly explain what you mean by that term?

A. I mean a helix or a number of such helices about a cylinder which are meshing with a circular gear, so that it appears, on rotating the screw, as if it were endless, because as soon as one thread becomes disengaged with the teeth another thread come along and takes it up,
20 and the action is the same as if a single thread were endless.

Rd-Q. 295. In other words, you mean that there is always an impelling surface in actual engagement with the impelled part?

A. That is correct.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. SEWARD:

30 Rx-Q. 296. Does the endless thread to which you have just referred, pass once or more than once around the circumference of the worm?

A. I think that is immaterial whether it goes around part of the circumference or many times, the effect is identically the same. I have never considered that there was any difference on this point.

Rx-Q. 297. Is the principle the same in operation?

A. Yes, the principle is just the same to all prac-
40 tical purposes.

Frederick Ray for Plaintiff—Recross.

Rx-Q. 298. It makes the same appearance whether the tooth goes around the circumference of the worm or whether it passes across the face of the worm?

A. In the case where the teeth of both gears are comparatively short, the appearance might be slightly different, but if you observe it carefully you can see the same effect.

Rx-Q. 299. Then you do not think that the word "end- 10 less" tooth defines the tooth which goes once or more around the circumference of the worm?

A. I have never considered the word "endless" tooth restricted to that condition where it goes around once or more.

Rx-Q. 300. At what angle of tooth in a worm does the straight side of the tooth change to a curved side?

A. Theoretically, in a worm there should not be any straight-sided teeth, because as soon as you get a worm 20 or, in other words, a helix, then the thread makes an angle with the plane perpendicular to the axis; and, consequently, if you pass another plane perpendicular to the tooth through the gear, you will have an ellipse, so that the tooth section lying in this last mentioned plane really lies upon a curved surface, and theoretically then it should be slightly curved, but the curvature is so slight that for practical purposes they make it straight, and it is easier to machine in a lathe when it is straight, which is the usual way of machining a spiral gear when the 30 angle is small like that. It would be very difficult in a lathe to machine a formed tooth, because you would have to have a formed tool, whereas, when the angles become greater it is usual to cut them in a milling machine, and then you can obtain Brown & Sharpe or other gear cutters which are properly formed and that is what is used.

Rx-Q. 301. And the result of the operation of these milling cutters is to make teeth with curved sides?

A. Yes, in general, although in the set of cutters to 40

Frederick Ray for Plaintiff—Recross.

make the complete range of teeth, there is included one cutter to make rack teeth with straight sides, but the ordinary lathe in which the usual gear of this type would be cut is not provided with means for driving such a cutter, so that it cannot be made use of except in a machine especially adapted to use it; so that such gears are commonly cut with a formed tool but with straight sides, as that is a simple form to produce.

10 Rx-Q. 302. Up to what tooth angle is it customary to cut the teeth with straight sides?

A. That practice differs. It would depend entirely upon the equipment of a machine shop as to how that would be done. You could cut a worm with a large angle with a straight side tooth and it would operate apparently all right and might do for most conditions. It is incorrect, however, in that it does not maintain a uniform velocity ratio between the driving gear and the driven
20 gear. That is, as each tooth passes by the other tooth there is a slight acceleration and retardation of the driven gear, assuming the driving gear makes constant rotation. To prevent that is the object of making these special forms of gear teeth, the involute, for instance; it is not simply to get the teeth to mesh together. Most any form could be used for that, but there are only certain geometrical forms for the surfaces of the teeth which will give a uniform velocity ratio between the driving gear and the driven gear.

30 Rx-Q. 303. Up to what angle is it correct to form the teeth with straight sides?

A. No appreciable error probably, for ordinary work, would be produced by using straight sides up to 20° , or possibly for many purposes up to maybe a slightly higher angle, 25° .

Rx-Q. 304. Do you mean a 20° or 25° angle of pitch of the tooth with respect to the plane perpendicular to the axis of the worm?

40 A. Yes.

Arthur F. Bedell for Plaintiff—Direct.

Rx-Q. 305. Is it a fact that when fluid pressure is admitted to the interior of a tire, its tendency is to force the tire into a shape circular in cross-section?

A. Yes, if we consider the walls of the tire as being perfectly flexible, then under internal pressure they take a circular cross-section.

Rx-Q. 306. And the force would be substantially equal in all directions?

A. Yes, the outward radial pressure would be equal in all directions. That is each square inch of surface of the inside of the tire would be subjected to the same load.

By Mr. Seward: I notify counsel for plaintiff that I shall want my expert to examine the model machine, "Plaintiff's Exhibit No. 29", after my expert returns from his vacation; and I therefore request counsel for plaintiff not to dismantle this exhibit or remove it to an inaccessible place.

Recross-examination closed.

Deposition closed. Signature waived.

Adjournment until Wednesday morning, August 11, 1920.

NEW YORK, N. Y., August 9, 1920.

Appearances: Same as before.

Whereupon ARTHUR F. BEDELL, a witness called on behalf of the plaintiff, being first duly sworn, in answer to interrogatories propounded to him by Mr. Rogers, deposes and says, as follows:

Q. 1. What is your name?

A. Arthur F. Bedell.

Q. 2. Where are you employed, Mr. Bedell?

A. Goodyear Tire & Rubber Company, Akron, Ohio.

Arthur F. Bedell for Plaintiff—Direct.

Q. 3. What is your position with the Goodyear Company?

A. Inspector in the Experimental Workshop.

Q. 4. Do you recall some tires that were made by Arthur R. Mackey, some sixty or ninety days ago, in the Goodyear plant at Akron, by the hand spinning method?

10 By Mr. Seward: I object to any testimony from this witness as to tests mentioned in Mr. Ray's deposition, on the ground that the same is immaterial, incompetent and irrelevant; and it is agreed that this objection may stand without repetition.

A. Yes, sir.

Q. 5. Who provided and delivered the material for those tires?

A. I provided and delivered it to Mr. Mackey.

20 Q. 6. And do you recall in the same connection some tires that were made on a Goodyear commercial machine by Al Shaw?

A. Yes, sir.

Q. 7. And who provided and delivered the material for those tires?

A. I provided and delivered it to Mr. Shaw.

Q. 8. Did you see these two sets of tires made, respectively, by Mr. Mackey and Mr. Shaw?

A. Yes, sir.

30 Q. 9. You say you saw these two sets of tires actually in construction by Messrs. Mackey and Shaw, respectively, is that correct?

A. Yes, sir.

Q. 10. Did you see the beads applied?

A. Yes, sir.

Q. 11. Did you see the chafing strips applied?

A. Yes, sir.

Q. 12. Did you see the rubber covers applied?

40 A. Yes, sir.

Arthur F. Bedell for Plaintiff—Cross.

Q. 13. And was the material that you delivered, respectively, to Messrs. Mackey and Shaw, the same in both instances?

A. Yes, sir.

Q. 14. And is the same true in connection with the chafing strips and rubber cover?

A. Yes, sir.

Q. 15. And did you see these tires finished in each instance? 10

A. I did.

Q. 16. Do you know what was done with the tires after the carcasses had been formed and the finishing operation had been concluded?

A. Yes, sir.

Q. 17. What was it?

A. They were taken to the curing room and cured.

Q. 18. Who took them to the curing room?

A. Why, Mr. Shaw and I, the Mackey tires; and the 20 machine made tires, Mr. Shaw and I and Mr. Ray.

Q. 19. Do you know whether or not the two sets of tires referred to were actually cured?

A. Yes, sir. They were.

Q. 20. Now, will you state whether or not the two sets of tires before you, Plaintiff's Exhibits Nos. 18 and 19, are the two sets of tires you have been testifying about?

A. Yes, sir. 30

Q. 21. How do you know that?

A. By marks. By the letter M on the Mackey tires, and the letter S on the Shaw,—the machine built tires.

Direct-examination closed.

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 22. How long have you been with the Goodyear Company?

A. It will be five years the 19th of last April. 40

Arthur F. Bedell for Plaintiff—Cross.

x-Q. 23. What positions have you held prior to the present one at the Goodyear plant?

A. The first position was on the tire testing machine; and the next, on cutting stock; then inspector, my present position.

x-Q. 24. How long have you held your present position?

10 A. About 2 years.

x-Q. 25. Did you see Mr. Mackey make every one of the tires comprised in Plaintiff's Exhibit 18?

A. Yes, sir.

x-Q. 26. Did you see him make each one throughout?

A. Yes, sir.

x-Q. 27. That is, you watched him make each of the tires in the said set completely from the start to finish?

A. Well, no, not every instant; I was not there every
20 move he made on the tires but practically all.

x-Q. 28. Did you see him make the first tire in the said set entirely?

A. Yes, sir.

x-Q. 29. Every single thing?

A. Yes, sir.

x-Q. 30. How about the second tire?

A. I did not see everything. I saw it about half made before I went away.

x-Q. 31. And how much did you see made of each
30 of the remaining tires of the said set?

A. Well, half of the tire anyhow.

x-Q. 32. You saw about the same amount of the making operation on each of the remaining tires of the set, is that right?

A. Yes, sir.

x-Q. 33. Were you standing near to Mr. Mackey?

A. Yes, sir.

x-Q. 34. Did you speak to Mr. Mackey about these
40 tires?

Arthur F. Bedell for Plaintiff—Cross.

A. No, I did not.

x-Q. 35. Did you hold any conversation with Mr. Mackey while he was making these tires?

A. Yes, I talked to Mr. Mackey some.

x-Q. 36. Did you say anything to Mr. Mackey about any of these tires?

A. Not to my knowledge, no.

x-Q. 37. Are you quite sure you did not mention ¹⁰ these tires to Mr. Mackey, or any of them?

A. No, I did not.

x-Q. 38. You mean by that you did not speak to him about these tires?

A. That is right.

x-Q. 39. Was anyone else with you and Mr. Shaw when you took the tires Mackey made to the vulcanizer?

A. No, sir. I would like to add a word,—there was ²⁰ a helper whose name I cannot recall.

x-Q. 40. Anyone else?

A. No, sir.

x-Q. 41. Have you examined these tires comprised in Plaintiff's Exhibits 18 and 19, before you gave your testimony just now?

A. I saw them at the shop.

x-Q. 42. Have you examined them here to identify them?

A. Nothing more than looking at them. ³⁰

x-Q. 43. Is the letter to which you referred evident on each of the tires of these sets at the present time?

A. Yes.

x-Q. 44. Is it on the tire or on the wrapper?

A. On the tire.

x-Q. 45. And you have looked at that letter on each of these tires?

A. Yes.

x-Q. 46. I mean this morning.

Arthur F. Bedell for Plaintiff—Cross.

A. No, I have seen the letter S but not the letter M, this morning.

x-Q. 47. The fact is that these tires as they now stand, or the majority of them, are wrapped so that the letters to which you have referred are not apparent, is that so?

A. I have not been able to see the letter M,—the ones with the M on.

10 x-Q. 48. The statement in my last question then was true as to the majority of the tires bearing the letter M in Exhibit 18, is that right?

A. Yes, sir.

x-Q. 49. But you have actually examined this morning all the tires in Exhibit 19, so as to see the letter S on each one?

A. Why no, I have not. It would be impossible to see them without taking the wrappers off.

20 x-Q. 50. Then is it a fact that a majority of the tires in Exhibit 19 are wrapped so that the letter S is not apparent?

A. They are.

x-Q. 51. Did Mr. Mackey put the rubber cover on the tires which he made?

A. Yes, sir.

x-Q. 52. Did you see him put them on in every case?

A. Yes, sir, most of them.

x-Q. 53. Did he have anyone help him put them on?

30 A. No, sir, not that I saw.

x-Q. 54. Did Mr. Mackey put all the beads on all these tires he made?

A. Yes, sir.

x-Q. 55. He did that himself?

A. Yes, sir.

x-Q. 56. In every case?

A. As far as I saw; yes, sir.

40 x-Q. 57. On how many tires of this set did you see Mr. Mackey place the beads himself?

Arthur F. Bedell for Plaintiff—Cross.

A. Well, better than half of them.

x-Q. 58. Did you supply the beads to Mr. Mackey?

A. Yes, sir.

x-Q. 59. Did you supply him all the material he used in making the tires?

A. Yes, sir.

x-Q. 60. Did you bring that to him in one lot for the ten tires, or in separate lots for each tire?

A. Yes, sir, for the ten tires in one lot.

x-Q. 61. Did you bring it to him all at one time?

A. Yes, sir.

x-Q. 62. And that was before he made the first tire of the set?

A. Yes, sir.

x-Q. 63. The tires in these sets, Exhibits No. 18 and No. 19, have no treads thereon, have they?

A. No, sir.

x-Q. 64. They have no breaker strips, have they?

A. No, sir.

x-Q. 65. By the tread in my previous question, I meant the outside rubber which contacts with the road while the tire is in use. You so understood it?

A. Yes, sir. That is the tread, yes, sir.

x-Q. 66. And by the breaker strip,—I refer to the loosely woven strip of fabric that is generally placed between the tread rubber and the layer of rubber that immediately covers the fabric. Do you so understand it?

A. Yes, sir, I understand it.

x-Q. 67. And that layer of ~~rubber~~ which immediately covers the fabric, you have referred to as the cover or it may be called the cushion?

A. Yes, it may be called either.

x-Q. 68. Did you see each of the tires made by Mr. Mackey vulcanized?

A. No, sir.

Arthur F. Bedell for Plaintiff—Cross.

x-Q. 69. Did you see Mr. Shaw make every one of the tires included in Exhibit 19?

A. Yes, sir.

x-Q. 70. Did you see him make each tire completely?

A. Yes, sir.

x-Q. 71. From beginning to end?

A. Yes, sir.

10 x-Q. 72. When did Mr. Shaw make these tires?

A. Well, now, the latter part of May.

x-Q. 73. How did it compare in time with the time when Mr. Mackay was making his tires?

A. How do you mean?

x-Q. 74. Was it before, or after, or at the same time?

A. It was after Mackey, yes sir.

x-Q. 75. Then Mr. Shaw did not begin to make his tires until Mr. Mackey had finished his; is that right?

20 A. Yes, sir.

x-Q. 76. Did you provide all the material that Mr. Shaw used?

A. Yes sir.

x-Q. 77. Did you provide that in one lot, at one time?

A. Yes, sir.

x-Q. 78. The tires made by Mr. Shaw also omit the tread and breaker strip, do they not?

A. Yes, sir.

30 x-Q. 79. Who else was present when Mr. Shaw made these tires?

A. I forget the gentleman's name,—Mr. Ray, Mr. Shaw, and myself.

x-Q. 80. Anyone else?

A. No.

x-Q. 81. Are you sure of that?

A. Nothing more than the help in the shop there.

x-Q. 82. What do you mean by "the help"?

40 A. That is, the men that worked in the department.

Arthur F. Bedell for Plaintiff—Cross.

x-Q. 83. Were they, or any of them, there observing Mr. Shaw, or were they doing their own work?

A. They were doing their own work,—merely passing by.

x-Q. 84. Then you mean to say that the only people who were observing Mr. Shaw's work were Mr. Shaw, Mr. Ray, and yourself?

A. Yes, sir.

x-Q. 85. Was that true of all the tires made by Mr. Shaw? 10

A. Yes, sir.

x-Q. 86. How long was it after Mackey finished his tires before Shaw started his?

A. Well I can't just recall the date as to that, the time.

x-Q. 87. Can you say about how long an interval there was?

A. Well, no. No, I could not. 20

x-Q. 88. Was it a week or less?

A. Well, I would say close on to that time.

x-Q. 89. Did you give any instructions to Mr. Shaw about making these tires?

A. No, sir.

x-Q. 90. Did you talk with Mr. Shaw about making them?

A. Yes, sir, we talked about the tires.

x-Q. 91. You talked to him about the tires while he was making them? 30

A. Yes, sir, as to the gages, etc., on the tires, what they should be.

x-Q. 92. Please tell me what you mean by "the gages"?

A. Why the gages of plies, that is the standard gages that they use in the standard tires of this size.

x-Q. 93. Do you mean that you talked with Mr. Shaw about the thickness of fabric to be used,—is that what you mean by "gages"? 40

Wayne A. Rowles for Plaintiff—Direct.

A. Yes, sir.

x-Q. 94. Did he tell you what he wanted, or did you provide him what you thought was right in fabric?

A. I provided what he should have for that size.

x-Q. 95. What was the size of these tires?

A. 34-4.

x-Q. 96. All of them?

10 A. Yes, sir.

x-Q. 97. They are all straight sides?

A. Yes, sir.

Cross-examination Closed.

Deposition Closed.

Signature waived.

NEW YORK, N. Y., August 9, 1920.

20

Appearances: Same as before.

Whereupon WAYNE A. ROWLES, a witness called on behalf of the plaintiff, being first duly sworn, in answer to interrogatories propounded to him by Mr. Rogers, deposes and says, as follows:

Q. 1. Please state your name.

A. Wayne A. Rowles.

30 Q. 2. Where are you employed, Mr. Rowles?

A. Goodyear Tire & Rubber Company, Akron, Ohio.

Q. 3. What is your position there?

A. Head inspector on curing.

Q. 4. How long have you occupied that position?

A. I have occupied that position three years.

Q. 5. Do you recall some sixty or ninety days ago superintending the curing of some special tires that were brought to you by Mr. Bedell and Mr. Shaw?

40 A. I do.

Wayne A. Rowles for Plaintiff—Direct.

Q. 6. And also a set that was brought to you by Mr. Bedell, Mr. Shaw and Mr. Ray?

A. Yes, sir.

Q. 7. Did you superintend the curing of these tires?

A. I did.

Q. 8. Do you happen to remember how the tires that were given you at this time were marked for identification?

A. Yes, sir. With the letters S and M in the respective sets. 10

Q. 9. Can you tell me, generally, how these two sets of tires marked respectively M and S were cured?

A. Just a single cure.

Q. 10. I hand you two charts, marked Plaintiff's Exhibit No. 17, and ask you, if you can, to tell me what they are.

By Mr. Seward: I object to any testimony from 20 this witness, or to the reception of any exhibits relative to the tests referred to by Mr. Ray on the ground that the same are immaterial, irrelevant and incompetent; and it is agreed that this objection may stand against the entire deposition of this witness without repetition, including the questions already asked.

A. Charts that show the cured tire.

Q. 11. How do they show it?

A. By the red line. 30

Q. 12. What do those red lines indicate?

A. Indicate the time the heat was on and off, and degrees of steam in vulcanizing.

Q. 13. Referring more particularly to the two sets of markings on those two charts, which are designated respectively M and S in blue pencil, will you tell me, if you can, what those particular markings signify and relate to?

A. They indicate that special cure.

Q. 14. What do you mean by "special cure"? 40

Wayne A. Rowles for Plaintiff—Direct.

A. It is another cure other than the two other heats shown on this chart.

Q. 15. Do you mean that when you used the word "special" that the cure was an extraordinary one or differed from the usual practice, or merely that the word designates a cure different from the other cures indicated on the same charts?

A. It designates another cure from the ones on the charts.

10 Q. 16. For instance, how long a cure is indicated by the markings designated M and S, respectively?

A. Two hours and fifty-five minutes.

Q. 17. And how long were the other cures indicated on the same charts?

A. Two hours.

Q. 18. Were these other cures indicated on the same charts single cures or double cures?

A. Double cures.

Q. 19. What do you mean by "double cures"?

20 A. In the double cure we first cure the carcass by itself, which constitutes the first step; we then cure it a second time after the tread has been applied, which is the second step.

Q. 20. I understand from your last answer that this double cure process was not followed in connection with the two cures which are designated by the blue letters M and S, but in these two instances the cures were single cures. Is that correct?

30 A. Yes.

Q. 21. What is the ordinary time that is given in the single cure method of vulcanizing?

A. I cannot answer that question. If you refer to the two specially designated cures you mentioned, it was two hours and fifty-five minutes.

Q. 22. Was two hours and fifty-five minutes the proper period to employ in giving this single cure.

A. It was, to the tires mentioned.

40 Direct-examination Closed.

Wayne A. Rowles for Plaintiff—Cross.

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 23. Do you have charge of the curing of all tires at the Goodyear plant?

A. No, sir.

x-Q. 24. Do you simply have charge of the inspection of the curing?

A. Of straight side tires.

x-Q. 25. Are the tires of which you have charge of the inspecting, cured by two cures or by one?

A. Which tires do you refer to?

x-Q. 26. I am not referring to these exhibits.

A. You are not?

x-Q. 27. No.

A. Well then, they have two cures.

x-Q. 28. You then, in the regular course of your work, do not inspect the tires made by the single cure process? I mean the process in which the complete tire is given only one cure.

A. No, I do not inspect that.

x-Q. 29. The tires which you inspect are those in which the carcass and rubber cover are first partially cured, and then the same tire with the addition of the tread is completely cured in a second cure, is that right?

A. Yes, sir.

x-Q. 30. On these charts which you have referred to, the cures other than those marked M and S are the cures of the carcass and rubber cover of other tires, is that right?

A. Yes, sir.

x-Q. 31. And those cures were made in the regular course of business?

A. Yes, sir.

x-Q. 32. And the time of the cure was two hours in each case?

A. Yes sir, in each case.

Wayne A. Rowles for Plaintiff—Cross.

x-Q. 33. That period of two hours was for the first of the two cures in each case?

A. Yes, sir.

x-Q. 34. Then those tires indicated on the charts, other than the tires marked S and M, were later given a second cure. Is that right?

A. Yes, sir.

10 x-Q. 35. How long was the second cure in each case?

A. That I cannot answer.

x-Q. 36. Why can't you answer it?

A. I never worked around there and had nothing to do with the cure.

x-Q. 37. Then, if I understand you correctly, you inspect only the first cure in the two-cure process. Is that right?

A. Only, yes, sir.

20 x-Q. 38. These tires marked S and M were in the same condition as the other tires indicated on the chart,—I mean in the same condition as to their stage of completion, were they not?

A. Yes, sir.

x-Q. 39. But these tires marked S and M were cured for fifty-five minutes longer than the other tires indicated on the charts?

A. Yes, sir.

30 x-Q. 40. Were these tires marked S and M the same size as the other tires indicated on the charts?

A. Yes, sir.

x-Q. 41. Is it your custom to fill each vulcanizer with tires only of the same size, in curing?

A. No, sir.

x-Q. 42. Do you vary the temperature of the cure, or the time of the cure for different sizes of tires?

A. Vary the time.

x-Q. 43. The temperature remains constant?

40 A. Yes, sir.

Wayne A. Rowles for Plaintiff—Cross.

x-Q. 44. Before you cured these tires marked S and M, had you ever completely cured a tire carcass with the rubber cover thereon but without the tread?

A. I, personally, had not.

x-Q. 45. Had you superintended such a cure?

A. No, sir.

x-Q. 46. Why do you say that two hours and fifty-five minutes was the proper cure for these tires marked S 10 and M?

A. I only cure according to instructions.

x-Q. 47. Then you, yourself, did not set that time of two hours and fifty-five minutes?

A. No, sir.

x-Q. 48. Who gave you those instructions?

A. Mr. Shaw,—Al Shaw.

x-Q. 49. Did you write anything on either of these charts?

A. I did. 20

x-Q. 50. Did you write the expression "2 hrs. cure at 284" on each of the charts?

A. I did not.

x-Q. 51. What did you write on these charts?

A. Special cure.

x-Q. 52. Together with your name?

A. Name, yes sir, on one.

x-Q. 53. You did not write "special cure" on more 30 than one, did you?

A. Yes, sir, I wrote "special cure" on both of them.

x-Q. 54. On one of these charts the initials "J. F." in lead pencil appear under the words "special cure". Did you write those initials there?

A. No, sir, that is the steam tender,—the time he started to work.

x-Q. 55. What does "150 B" mean on each of these charts?

A. It denotes the department number. 40

Wayne A. Rowles for Plaintiff—Cross.

x-Q. 56. And what does "H. 32" and "H. 33" mean?

A. Number of heater or vulcanizer.

x-Q. 57. What does 83/80 and 83/79 mean?

A. That is the serial number of the vulcanizer.

x-Q. 58. These charts are dated May 27, 1920 and May 28, 1920. Does that mean that the tires marked M and S were cured on these two days?

10 A. Yes, sir.

x-Q. 59. The red ink line on the chart bearing the letter M in blue, shows a depression or inward curve near one edge. Can you explain what that means?

A. Vibration of the heater.

x-Q. 60. What do you mean by vibration of the heater?

A. Its working jars or causes the pen to mark a vibration on the chart.

x-Q. 61. On the chart, would this not indicate that the
20 temperature had fallen towards 280 for a period?

A. It denotes on there it had fallen for a period.

x-Q. 62. One of these charts has the name "Fearner" on it. Who wrote that on?

A. Fearner, himself. He was the steam tender.

x-Q. 63. What does the steam tender do?

A. He turns the steam on and off.

x-Q. 64. Does his name apply to each cure or heat on the chart, or to only one cure?

30 A. It only applies to the shift of his working. It don't apply to any single cure.

x-Q. 65. That is, his name does not apply to the cure of the tires marked S and M, is that right?

A. No, sir, it does not apply to them.

x-Q. 66. On the back of one of these charts it says: "Hold for A. Shaw". Did you write that there?

A. I did.

x-Q. 67. Why did you write that?

40 A. So the chart would not go through to the Superintendent's office with the rest. We wanted to hold it up.

Wayne A. Rowles for Plaintiff—Cross.

x-Q. 68. You wanted this chart held out specially, instead of going through in the regular course with the other charts?

A. Yes, sir.

x-Q. 69. One of these charts indicates that Mr. Fearner was the steam tender in charge of the cure of the tires marked M, does it not? 10

A. Why no, sir. It is just where he starts to work. He puts his initial on the chart to show that that is the shift he worked, and that cure came right over his name.

x-Q. 70. Does it mean he was working when the tires marked M were being cured?

A. Yes, sir.

x-Q. 71. And was he the man who had charge of turning the steam on for the cure of the tires marked M? 20

A. He turned it on,—I had charge of it.

x-Q. 72. On the chart bearing the letter S in blue, there appears to be some lead pencil writing underneath the words written in ink "special cure Rowles". Can you tell me what that lead pencil is?

A. That is "special cure Rowles". I retraced it in the office, with ink.

x-Q. 73. What position did you hold before your present one?

A. Tending steam. 30

x-Q. 74. At the Goodyear plant?

A. Yes, sir.

x-Q. 75. For how many years?

A. Five years.

x-Q. 76. And what before that?

A. That is as long as I worked at the Goodyear.

Cross-examination closed.

Deposition closed.

Signature waived. 40

William H. Price, Jr., for Plaintiff—Direct.

NEW YORK, N. Y., August 11, 1920.

Met pursuant to adjournment.

Appearances: Same as before.

Whereupon WILLIAM H. PRICE, JR., a witness called on behalf of the plaintiff, being first duly sworn, in answer to
10 interrogatories propounded to him by Mr. Rogers, deposes and says, as follows:

Q. 1. What is your name?

A. William H. Price, Jr.

Q. 2. Where are you employed, Mr. Price?

A. Goodyear Tire & Rubber Company, Akron, Ohio.

Q. 3. And what is your position there?

A. Assistant Manager of the Technical Service Division.

20 Q. 4. How long have you occupied that position?

A. One year and a half.

Q. 5. How long have you been altogether in the employ of the Goodyear Company?

A. Four and one-half years.

Q. 6. And prior to your present position, what duties did you perform?

A. I was actively engaged in the development and service compounding of all pneumatic tire stocks.

30 Q. 7. During the course of your employment with the Goodyear Company, have you become familiar with the curing or vulcanizing of tires?

A. I have.

Q. 8. And you are familiar with the Goodyear practice in determining whether or not tires are properly cured?

A. I am.

Q. 9. I call your attention to the tire comprised in Plaintiff's Exhibit No. 18, and marked M^c, and ask you to
40 state whether or not that tire has been properly cured

William H. Price, Jr., for Plaintiff—Direct.

according to the Goodyear commercial practice and tests, and give the reason for your answer.

A. I have examined the tire M⁶ and it is, according to the Goodyear standard practice, properly cured. For that purpose I have cut out a section of the tire which I have specifically examined and which is in part the basis for my statement.

Q. 10. I direct your attention to Plaintiff's Exhibit 10 No. 17 comprising two charts, and particularly therein to the red lines marked in blue pencil "M" and "S", and ask you to state whether or not these charts indicate that the heat treatment thereby recorded was the proper curing or vulcanizing treatment for a single cure in connection with 34-4 tires.

A. The curing chart on the "M" tire representing a single cure, is the correct cure for that particular tire. The cure for the first cure on the "S" tire is also correct. 20

Q. 11. Do I understand you to say that the red lines marked "S", that you have referred to, indicate the first step of a double cure?

A. No, sir. I am in error there. That represents a single cure, I find on adding up the number of minutes employed.

Q. 12. In other words, both of the cures indicated by the blue letters "M" and "S" are single cures, is that correct.

A. Yes, sir. 30

Q. 13. I will ask you to examine again the cure indicated by the blue letter M, and to note particularly the slight jog or depression in the red line, near the end of the cure, and to state whether or not the variation in temperature or pressure indicated thereby would at all affect the efficiency of the particular cure.

A. No, the jog in the curing curve at the end, would not affect to any extent the efficiency of the particular cure. 40

William H. Price, Jr., for Plaintiff—Cross.

Q. 14. Are you familiar with the rubber compounds used commercially by the Goodyear Company?

A. Yes, sir.

Q. 15. Can you state from that familiarity the number of the compound that was used for standard practice during the month of May, 1920?

A. Yes, sir. 1787 compound, used for friction and 10 coat.

Direct-examination closed.

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 16. In order to test Exhibit tire M⁶, you cut out a section about an inch in dimension, considered circumferentially of the tire, and extending across the tread portion of the tire from about an inch and one-quarter to about an inch and three-quarters above the bead on 20 each side, is that correct?

A. I did.

x-Q. 17. Is that the only test you made on that tire?

A. Yes, sir.

x-Q. 18. How did you test that section?

A. The section was tested by first separating two of the frictioned and coated plies of the carcass and subsequently examining them for cure with the 1787 compound; a further test was made by cutting off a portion 30 of the side wall stock and testing that for stretch and set; the final test made upon this section was to strip back a portion of the 1787 top cover and test this for stretch and set.

x-Q. 19. With what did you compare the result of these tests in order to determine whether or not the cure was correct?

A. I compared the results of this test section with Goodyear standard practice and results in order to deter- 40 mine whether or not this was a proper cure.

William H. Price, Jr., for Plaintiff—Cross.

x-Q. 20. What do you mean by "Goodyear standard practice and results"?

A. I mean that it is Goodyear standard practice to examine sections of tires for correctness of cure, in this manner, and to rely upon the results obtained as a direct indication of the cure.

x-Q. 21. Are these sections examined in accordance with Goodyear standard practice with which you compared the results of this test, sections of carcasses or of completed tires? ¹⁰

A. The sections examined in the Goodyear standard practice with which the special section was compared, are treaded tires.

x-Q. 22. You mean, do you not, complete tires which have been vulcanized to a finished condition by one cure?

A. No, sir.

x-Q. 23. Do you mean complete tires which have been vulcanized to a finished condition by two cures? ²⁰

A. I do.

x-Q. 24. In that two-cure vulcanization, the carcass, including the cushion or cover, is first partially cured; after which the breaker strip and tread are applied and the entire tire completely vulcanized in a second cure?

A. That is correct.

x-Q. 25. With reference to the chart, Plaintiff's Exhibit No. 17, on which the letter M in blue appears, the jog in the curing curve covers a time period of about fifteen minutes and a change in temperature of about four degrees, does it not? ³⁰

A. It does.

x-Q. 26. The total period of that cure was a little less than three hours, is that correct?

A. It is.

x-Q. 27. When you say that the 1787 compound was Goodyear standard practice in May for friction and coat- ⁴⁰

William H. Price, Jr., for Plaintiff—Redirect.

ing, do you mean for the rubber with which the fabric used in making the carcass was impregnated and coated?

A. I do.

x-Q. 28. The fabric is thus impregnated and coated before the tire is built up, is that correct?

A. Yes, sir.

x-Q. 29. Was this 1787 standard for the two-cure tires or the one-cure tires, or both?

10 A. For the two-cure tire.

Cross-examination closed.

REDIRECT-EXAMINATION BY MR. ROGERS:

Rd-Q. 30. I understand that there are two methods of vulcanizing employed in the Goodyear factory, namely, the single cure method and the double cure method. Is the result aimed at to procure the same ultimate result in the vulcanizing of the tire, whether the one-cure method
20 or the two-cure method be employed?

A. It is.

Rd-Q. 31. Do I understand from your last answer that the condition of the vulcanized carcass would be the same whether the cure is made in one step or in two steps?

A. The condition of the vulcanized carcass with respect to quality would be the same whether a single or double cure were used. I would like to add to that, if I might, provided the proper cure were obtained.

30 Rd-Q. 32. In making the tests you have referred to, would those tests be the same whether the single cure or the double cure method were employed?

A. They would.

R-d-Q. 33. Would it make any difference whether or not the tread was actually on the tire, in determining the condition of the cure?

A. No, sir.

Rd-Q. 34. Do you regard the time indicated on these
40 vulcanizing charts (slightly less than three hours) as a

William H. Price, Jr., for Plaintiff—Recross.

proper time of cure for tires in the single cure method in connection with the compound 1787?

A. I do.

Rd-Q. 35. Do I understand correctly that the character of test you have employed in connection with the particular tire under discussion, would be exactly the same as you would employ if that tire had been cured by the two step method?

10

A. Yes, sir.

Redirect-examination closed.

RECROSS-EXAMINATION BY MR. SEWARD:

Rx-Q. 36. Do you mean that this exhibit tire M⁶ was cured for a period of time and at a temperature the same as would be given a complete 34-4 tire cured by the single cure in accordance with the Goodyear standard practice?

A. I am not at liberty to give testimony to the effect that Goodyear would cure a 34-4 straight side fabric tire in the same cure as exhibit tire M⁶; but I do testify that the cure given to exhibit tire M⁶ is a proper cure to attain the desired quality.

20

Rx-Q. 37. One of the re-direct questions and answers was, as follows: "Do you regard the time indicated on these vulcanizing charts (slightly less than three hours) as a proper time of cure for tires in the single cure method in connection with the compound 1787? A. I do."

30

Upon what do you base your answer to the said question?

A. I base my answer to the said question on an intimate knowledge of so-called curing curves of the aforementioned 1787 stock.

Rx-Q. 38. And you do not base it upon comparison with Goodyear practice in curing single cure tires?

A. Not wholly.

Rx-Q. 39. When you referred to the two-cure process

40

Roland S. Trogner for Plaintiff—Direct.

or vulcanization, did you refer to that process in which an uncured tread is applied to a partially cured carcass, or a partially cured tread applied to a partially cured carcass, before the second cure?

A. That which we have discussed may refer to either a green tread, so-called, or a partially cured tread. It is equally applicable to both.

10 Rx-Q. 40. The cure given this exhibit tire carcass M⁶ was nearly fifty per cent. longer than that given to the carcass in the first cure of the two-cure process according to Goodyear standard practice, is that correct?

A. It was.

Rx-Q. 41. And the temperature of the cure was the same in both cases?

A. Substantially so.

Recross-examination closed.

20 Deposition closed.

Signature waived.

NEW YORK, N. Y., August 11, 1920.

Appearances: Same as before.

Whereupon ROLAND S. TROGNER, a witness called on behalf of the plaintiff, being first duly sworn, in answer
30 to interrogatories propounded to him by Mr. Rogers, deposes and says, as follows:

Q. 1. What is your name?

A. Roland S. Trogner.

Q. 2. Where are you employed, Mr. Trogner?

A. Goodyear Tire & Rubber Company, Akron, Ohio.

Q. 3. How long have you been with the Goodyear Company?

A. Four years and two months, approximately.

40 Q. 4. Have you made any investigation to determine

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the similarity or dissimilarity between the Goodyear commercial carcass-making machines and the carcass-making machines supplied by plaintiff to his licensees?

A. I have.

Q. 5. What was the nature of that investigation. How did you make it?

A. I went through the old records, old photographs, tire machine orders, and other data relating to this particular subject. 10

Q. 6. During the time since you have been with the Goodyear Company, have you had personal knowledge of the machines that were sent out to licensees?

A. I have had personal knowledge during the entire time I have been with the Goodyear Company.

Q. 7. Will you please say whether or not the machines sent out to plaintiff's licensees have been the same as those used by the Goodyear Company in commercial practice? In this connection please understand that I am 20 more particularly interested in the side forming devices, namely, the slide or carriage, the arms thereon which support the spinning-rolls, the spinning-rolls carried thereby, and the means for forcing the spinning-rolls against the side of the core. Unless defendant's counsel is interested in the subject, you need not discuss extraneous details such as the fabric supply devices, the tension mechanism, the bead placing devices, etc., etc.

A. I would say they were substantially the same. 30

Q. 8. Can you state to what extent, if at all, there have been variations in the form of the side forming devices under discussion? If you like, and to clarify your answer, you may refer to any photograph or the like you may have in your possession.

A. There have been changes made in the forms of springs used to force or retain the forming disk against the core, as well as the particular arrangement of manipulating the stitcher arms manually. There have 40

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also been changes made in the method of mounting the forming disks upon the end of the arms.

I present two photographs which I have selected as typical of the form of machines referred to by me, No. 1 being a very early form of machine, No. 2 being a later form of machine.

10 Plaintiff's counsel introduces the two photographs in evidence, marked "Plaintiff's Exhibit No. 35, Photographs of State Machines".

Q. 9. You said that changes have been made from time to time in the devices employed for forcing the forming rolls against the side of the core. Will you say more concisely what you mean by that general statement?

20 A. In the early days, as clearly shown in photograph No. 1, they used upstanding pins to control the movements of the stitcher arms. These upstanding pins were later removed or cut off, and a cam plate mounted on the carriage for effecting the movement of these arms. The cam plate was formed with slots which were in engagement with the stitcher arms in such a way that the movement of the cam in one direction caused the two arms to be brought together, thereby causing the stitcher arms to free the core; and whereby the movement of the cam in the opposite direction caused the stitcher arms to engage
30 the core.

Q. 10. What was the advantage of this cam plate arrangement?

A. It enabled the operator to control the action of the stitcher arms to a far better extent than the upstanding pins.

Q. 11. In other words, the manipulation of the cam plate moved both stitcher arms, is that correct?

A. It did.

40 Q. 12. Was it possible in the other form of device to

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which you referred, for the operator to control both of the stitcher arms with one hand?

A. It was possible.

Q. 13. But the slotted cam plate made it more convenient for the operator, is that correct?

A. Yes, sir.

Q. 14. Now referring to the springs or other means employed for forcing the rolls against the side of the core, what, if any, change was made in these devices? 10

A. In the early days they used a spiral compression spring to force the stitcher disks against the core, which were subsequently removed and a torsion spring substituted, for the same purpose.

Q. 15. Are these two changes to which you referred,—the substitution of the cam plate for the two upstanding handles of the stitcher arms, and the torsion spring instead of the compression spring,—indicated in the two photographs which you have produced? 20

A. They are not. No. 1 shows, in the case of the controlling mechanism for the stitcher arms, the upstanding pins I referred to; whereas, in photograph No. 2, the cam plate is illustrated.

In the case of the springs, photograph No. 1 shows the spiral compression springs I referred to. In the case of the springs, both photographs show the spiral compression springs I referred to. The torsion springs substituted at a later date are not shown in either of the photographs. 30

Q. 16. I note in photograph No. 2 that the slide or carriage seems to be provided with a stop. What was the purpose of that arrangement?

A. That was used to limit the forward movement of the carriage.

Q. 17. Was that provision of the stop embodied in all subsequent machines?

A. It was not.

Q. 18. Why not?

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A. They found in later practice that this was unnecessary.

Q. 19. Now, you have referred to three differences in construction and arrangement of the side forming devices, namely, the substitution of a torsion spring for a compression spring, the substitution of a control cam plate for the two upstanding handles of the arms, and the employment of a stop to limit the travel of the slide
10 or carriage. Will you state whether or not there were any additional changes or modifications in respect to the side forming devices, in either the machines used by the Goodyear Company commercially or those furnished to its licensees by plaintiff?

A. They have from time to time changed the form of mounting the stitcher disks on the stitcher arms. These changes related to the form of ball bearing and raceways used. I would say that no other substantial changes have
20 been made in the side forming devices of these machines.

Q. 20. Were these changes made from time to time in both the Goodyear commercial machines and also in the licensee machines?

A. They were.

Q. 21. Do you know of any instances where machines previously employed by the Goodyear Company commercially were sent out to licensees?

A. I do. I would say that a large portion of Mr. Seiberling's licensees were supplied with machines that
30 were previously used commercially in the Goodyear factory.

Q. 22. You may state, generally, how such machines were provided to the licensees.

A. In the case of licensees who wanted supposed used machines, they were completely rebuilt and placed in first-class condition before being shipped to the licensee. I mean that the gears were replaced, bearings rebabbitted, new parts supplied for those that were worn, etc.

40 Q. 23. When these machines were rebuilt for the

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purpose of supplying them to licensees, was their construction altered?

A. Not unless the licensee requested it.

Q. 24. From the result of your own experience and the investigation you have made on the subject, would you say that so far as the side forming devices are concerned, the machines used by the licensees have been substantially the same as those used by the Goodyear 10 Company?

A. I would say that the side forming devices were substantially the same in both cases.

Q. 25. In my previous questions I have limited you to the discussion of the side forming devices. You don't mean to say, do you, that there were no changes in other parts of the machine, such as the fabric supply mechanism, tension devices, etc., etc.?

A. I do not mean to say that there were not other 20 changes made outside of the side forming mechanisms.

By Mr. Seward: I object to the entire direct-examination as incompetent, immaterial and irrelevant, and move to strike the same out.

Direct-examination closed.

CROSS-EXAMINATION BY MR. SEWARD:

x-Q. 26. Does photograph No. 1 of Plaintiff's Exhibit No. 35 show at the right a partially constructed tire in 30 which the outer layer of fabric has been stretched circumferentially on the core, and the side forming spinning-rolls are approximately at the beginning of their inward movement?

A. Yes, it does.

x-Q. 27. Does Photograph No. 2 of Plaintiff's Exhibit No. 35 show a partially formed tire in which the outer layer of fabric has been circumferentially stretched on the core, and the side forming spinning-rolls have 40

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traversed part of their inward movement and thereby partially formed the said layer of fabric on the side of the core?

A. It does.

x-Q. 28. In this Photograph No. 2 the side forming rolls have not completed their inward movement or operation on the outer layer of fabric, have they?

10 A. I would say that the spinning rolls have just about completed their inward radial movement on the outer layer of fabric on the core.

x-Q. 29. I shall have to ask your age, Mr. Trogner.

A. 27,—28 in November.

Cross-examination closed.

Deposition closed.

Signature waived.

20 Plaintiff's counsel, in response to the request by defendant's counsel, during the deposition of the witness Seiberling, for more definite information on certain points, states he is advised, as follows:

In connection with x-Q. 155, that since January 1919 plaintiff has not provided his licensees with any machines which embodied further improvements shown in patents subsequent to the State patent in suit.

30 In connection with x-Qs. 156 to 158, that the Howe Rubber Company of New Brunswick, New Jersey, did not accept the modified form of license referred to, and returned to plaintiff the single machine it had been using.

40 In connection with x-Qs. 159 and 160, that no other licensee has refused to accept the modified form of license or returned its machine; although negotiations have not been conducted to the final point with several of the licensees who are still working under the original agreement.

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In connection with x-Q. 161, that among the names of the licensees, specified in answer to Q. 49, those who have taken a license since January, 1919, are the following:

The Batavia Rubber Company,
 The George Grow Auto Company,
 The Ideal Tire & Rubber Company,
 The Iowa Cord Tire Company, 10
 The Marion Tire & Rubber Company,
 The New Castle Rubber Company,
 The Owen Tire & Rubber Company,
 The Quality Tire & Rubber Company,
 (License transferred from Long Wear
 Rubber Co.)
 The Rubber Products Company,
 The Yale Tire & Rubber Company.

In connection with x-Qs. 198 to 200, plaintiff's²⁰
 counsel produces copies of the forms of license
 agreement that plaintiff has been using since Jan-
 uary, 1919, and introduces the same in evidence as
 "Plaintiff's Exhibit No. 16, Plaintiff's Forms of
 License Agreement Since January 1919."

Proofs closed.

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